SOIL SURVEY OF

Coleman County, Texas

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Texas Agricultural Experiment Station

Issued November 1974

Major fieldwork for this soil survey was done in the period 1963–68. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1968. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Central Colorado Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, USDA, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Coleman County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol, according to intensity mapped, and gives the capability classification of each. It also shows the page where each soil is described and the page for the range site in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the range sites and capability units.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

Ranchers and others can find, under "Use of the Soils for Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Engineers, builders, community planners, and others can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices and the choice of sites for nonindustrial buildings and for recreation areas.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers to Coleman County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "Additional Facts About the County," at the back of the survey.

Cover picture: **Cattle on Deep Upland Range Site. The soil is Olton clay loam, 0 to 1 percent slopes.**

U.S. GOVERNMENT PRINTING OFFICE: 1974

For sale by the Superintendent of Documents
U.S. Government Printing Office, Washington, D.C. 20402

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SOIL SURVEY OF COLEMAN COUNTY, TEXAS

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

COLEMAN COUNTY, in the central part of Texas, has an area of 820,480 acres or 1,282 square miles (fig. 1). It extends about 31 miles from east to west and about 42 miles from north to south. The Colorado River forms the southern boundary.

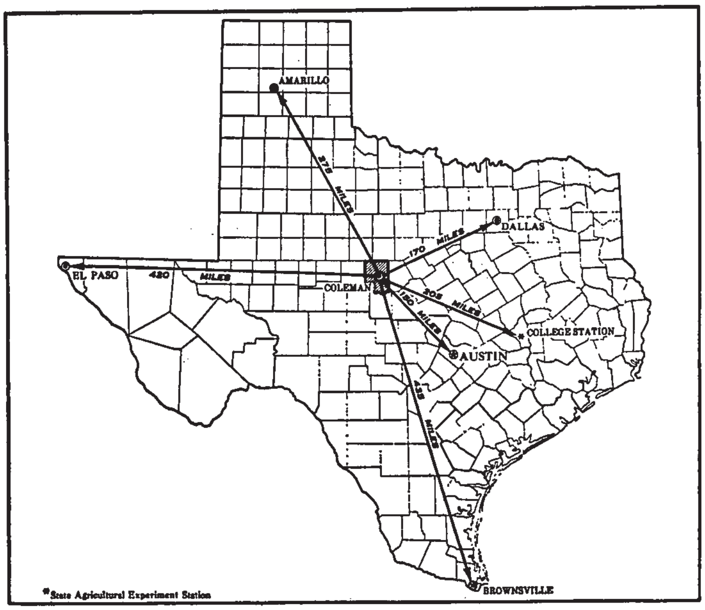

Figure 1.—**Location of Coleman County in Texas.**

Most of the county is gently undulating upland. Elevation above sea level ranges from about 1,300 feet at the Colorado River to about 2,250 feet in the northwestern part of the county.

About 62 percent of the county is used as range. The raising of cattle and sheep is the principal agricultural enterprise. The rest of the agricultural land is cultivated or is in old fields that were once cultivated. Small grains, sorghums, and cotton are the principal crops.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Coleman County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. A soil series is ordinarily named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Abilene and Valera, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Pedernales fine sandy loam, 1 to 3 percent slopes, is one of several phases within the Pedernales series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other

kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Coleman County: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Menard-Weymouth complex, 1 to 5 percent slopes, eroded, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Tarrant and Purves soils, undulating, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Stony land is a land type in Coleman County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils suitable for cultivation.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of rangeland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others; then they adjust the groups according to the results of their studies and consultation. Thus, the capability groups, range sites, or similar soil groupings that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the nine soil associations in Coleman County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this county have been grouped into three general kinds of landscapes for broad interpretative purposes. Each of the broad groups and its included soil associations is described in the following pages. The terms for texture used in the title for several of the associations apply to the texture of the surface layer. For example, in the title of association 1, the words loamy and clayey refer to the texture of the surface layer.

Very Shallow or Shallow Soils Over Limestone, Shaly Clay, or Strongly Cemented Caliche

This group of associations makes up about 50 percent of the county. The soils are dominantly stony and range from gently sloping to moderately steep. Slopes range from 1 to 20 percent but are mostly about 1 to 15 percent. Most of the soils in this group are best suited to range or wildlife.

1. Tarrant-Purves-Owens association

Very shallow to shallow, gently sloping to moderately steep, loamy and clayey soils over limestone and shaly clay

This association is made up of dominantly undulating soils that have slopes of from 1 to 8 percent. Some narrow strips within the association have steeper slopes of from 12 to 15 percent. In most places the steeper slopes have an eastern exposure or form the valley walls of local streams.

This association makes up about 36 percent of the county. Tarrant soils account for about 25 percent of the association, Purves soils 18 percent, and Owens soils 8 percent. Minor areas of Frio, Kavett, Krum, Speck, and Tobosa soils and Stony land make up most of the remaining 49 percent.

Tarrant soils, predominantly intermixed with Purves soils, are on ridgetops and side slopes. These soils have a clay surface layer about 14 inches thick. The upper 6 inches is dark grayish brown and is about 10 percent limestone pebbles. The lower 8 inches is brown and is about 80 percent limestone fragments. The underlying material, extending to a depth of 16 inches, is fractured limestone bedrock.

Purves soils occupy slightly benched areas closely associated with Owens soils. These Purves soils have a

surface layer about 18 inches thick. The upper 9 inches is dark grayish-brown clay loam that is about 11 percent limestone pebbles. The lower 9 inches is brown clay that is about 10 percent limestone pebbles. The underlying material is hard limestone that extends to a depth of more than 22 inches.

Owens soils range from moderately steep on side slopes to gently sloping on foot slopes. These soils have a grayish-brown clay surface layer about 7 inches thick. The next layer is pale-brown clay to a depth of 18 inches. The underlying material is brown and olive-gray shaly clay that extends to a depth of 36 inches.

Most of this association is in native vegetation and is used for range.

The Tarrant-Purves-Owens association supports many kinds of wildlife. Much of the area is suitable for wildlife management and hunting. Many sites on or near numerous private lakes and ponds also are suitable for fishing, boating, picnicking, and camping.

2. *Kavett-Talpa association*

Very shallow to shallow, gently sloping and undulating, clayey and loamy soils over limestone

This association is made up of dominantly undulating soils on uplands. Slopes range mostly from 2 to 8 percent.

This association makes up about 9 percent of the county. Kavett soils form about 40 percent of the association, and Talpa soils 31 percent. Frio, Kimbrough, and Valera soils, and Stony land make up most of the remaining 29 percent.

Kavett soils typically are adjacent to the Talpa soils in alternate strips 50 to 200 feet wide. These soils are on the upper part of the slightly benched strips. They have a silty clay surface layer about 17 inches thick. The upper 9 inches is dark grayish brown and contains a few pebbles. The lower 8 inches is brown and is about 10 percent limestone fragments. The underlying material, extending to a depth of 23 inches, is limestone fragments strongly cemented by caliche. Below this is hard limestone.

Talpa soils are on the lower edges of slightly benched strips above layers of limestone that outcrop or are near the surface on the side slopes. Talpa soils have a grayish-brown clay loam surface layer about 8 inches thick that contains a few limestone and caliche fragments. The underlying material is hard limestone that has a coating of caliche.

Most of the Kavett-Talpa association is in large ranches. The soils support few trees and only a small amount of brush, but they are well suited to the production of native grasses. These nonarable soils furnish grazing, and the scattered areas of arable soils provide ranchers an opportunity to grow crops for supplemental grazing and forage.

This association also provides habitat for wildlife. Selected areas are well suited to wildlife management and hunting leases.

3. *Tarrant association*

Very shallow to shallow, undulating, clayey soils over limestone

This association is made up of undulating erosional uplands that occupy the highest elevations in the county. Abrupt escarpments mark the edges of the association. Slopes are mainly 1 to 8 percent.

This association covers about 4 percent of the county. Tarrant soils make up about 80 percent of the association. The remaining 20 percent is mainly Menard, Pedernales, and Somervell soils.

Tarrant soils have a clay surface layer about 14 inches thick. The upper 6 inches is dark grayish brown and is about 10 percent limestone fragments. The lower 8 inches is brown and is about 80 percent limestone fragments. Below a depth of 14 inches is fractured limestone bedrock.

Most of this association is in large ranches. The native vegetation is mainly prairie grasses and scattered clumps of trees. The association is well suited as ranch land and as wildlife habitat.

4. *Kimbrough-Mereta association*

Very shallow to shallow, gently sloping to undulating, loamy soils over strongly cemented caliche

The surface of this association is dominantly undulating. Slopes range mostly from 2 to 8 percent.

This association makes up about 1 percent of the county. Kimbrough soils make up about 40 percent of the association, and Mereta soils about 35 percent. These soils are intermixed. The remaining 25 percent is made up mainly of Nuvalde, Purves, Rowena, and Tarrant soils.

Kimbrough soils have a dark-brown clay loam surface layer about 6 inches thick that contains a few caliche fragments. The next layer is white strongly cemented caliche about 6 inches thick. The underlying material is white to yellow silt loam and loam that is mostly calcium carbonate.

Mereta soils have a brown clay loam surface layer, about 18 inches thick, that is underlain by a layer of strongly cemented caliche about 4 inches thick. Below this is pink silty clay loam that is mostly calcium carbonate.

This association is mainly in range and is best suited to this use. Some of the caliche underlying the Kimbrough and Mereta soils is used locally for road material. Several small caliche pits are located in this association.

Moderately Deep or Deep Soils Over Limestone or Sandstone, or Formed in Old Alluvial Sediments

This group of associations makes up about 42 percent of the county. Most of the soils of this group are suitable for cultivation, range, or wildlife management. The main part of the cultivated land in the county is in this group. Slopes are dominantly less than 3 percent.

5. *Tobosa-Rowena-Valera association*

Deep to moderately deep, nearly level to gently sloping, clayey and loamy soils over limestone or formed in old alluvium

This association is made up of broad shallow valleys and smooth upland tracts. Slopes range from 0 to 3 percent.

This association makes up about 30 percent of the county. Tobosa soils cover about 28 percent of the associa-

tion, Rowena soils about 13 percent, and Valera about 12 percent. The remaining 47 percent mainly consists of Frio, Kavett, Krum, Nuvalde, Purves, and Tarrant soils.

Tobosa soils are nearly level to gently sloping and are on uplands. These soils have a clay surface layer about 26 inches thick. The upper 6 inches is dark grayish brown, and the lower 20 inches is brown. The next layer, extending to a depth of 50 inches, is brown clay that has intersecting slickensides. The underlying material, extending to a depth of 72 inches, is reddish-yellow silty clay that is about 10 percent pockets and streaks of soft white lime.

Rowena soils are nearly level to gently sloping and are on uplands. These soils have a surface layer about 16 inches thick. The upper 6 inches is dark grayish-brown clay loam, and the lower 10 inches is dark grayish-brown clay containing a few lime concretions. The next layer, 14 inches thick, is dark-brown clay that is about 5 percent lime concretions. The underlying material, extending to a depth of 50 inches, is pink clay loam. Beneath this, and extending to a depth of 94 inches, is light-brown clay that is 10 to 20 percent soft white lime and lime concretions.

Valera soils are gently sloping and are on the floors and sides of shallow valleys. These soils have a surface layer about 22 inches thick. The upper 11 inches is dark grayish-brown clay, and the lower 11 inches is brown clay. The next layer is 6 inches of brown clay that is about 10 percent lime concretions and caliche-coated pebbles. The next layer, about 7 inches thick, is a very pale brown silty clay loam that is about 50 percent soft white lime. The underlying material is limestone fragments embedded in cemented caliche. This cemented material extends to a depth of 58 inches.

The soils of this association are suited to cultivation or to use as range. Much of this association is cultivated; but each year, a part of this land is converted to range. Many of the crops grown are used for grazing or as feed for livestock.

Selected areas in this association are suited to wildlife management and hunting leases. Parts of the association support many kinds of wildlife.

6. *Menard-Pedernales association*

Deep, gently sloping, loamy soils formed in old alluvium

This association is on gently sloping uplands. Slopes are mostly 1 to 3 percent.

This association makes up about 7 percent of the county. Menard soils cover about 36 percent of the association, and Pedernales soils about 16 percent. The remaining 48 percent is mainly Abilene, Callahan, Portales, and Weymouth soils.

Menard soils are in the upper parts of broad valleys and below foot slopes of the limestone hills. These soils have a brown fine sandy loam surface layer about 6 inches thick. The next layer is 18 inches of red sandy clay loam. The next lower layer is 18 inches of yellowish-red sandy clay loam that contains a few small lumps and concretions of lime. The underlying material, extending to a depth of 72 inches, is reddish yellow. It is loam in the upper part and very fine sandy loam in the lower part.

Pedernales soils are in shallow valleys and on side slopes. These soils have a light-brown fine sandy loam surface layer about 8 inches thick. The next layer is yellowish-red clay, 20 inches thick. The next lower layer is mottled clay loam that extends to a depth of 46 inches. It is yellowish red in the upper part and light reddish brown in the lower part. The underlying material, extending to a depth of 54 inches, is pinkish-white to reddish-yellow, brittle loam that is about 3 percent whitish soft lumps and concretions of lime.

Most of this association is well suited to cultivation, and more than half of the acreage is cultivated. No large ranches are in this association. Most farms are about 100 to 400 acres in size. Most farm operators in the area work on more than one farm or have other employment. Crops are used mainly as feed and forage for livestock. Some of the cultivated land has been seeded to range grasses.

Selected areas can be used for wildlife habitat and recreational facilities. Many kinds of wildlife inhabit this association.

7. *Bonti-Olton-Rowena association*

Moderately deep to deep, nearly level to gently sloping and undulating, loamy soils over sandstone or formed in old alluvium

The Bonti-Olton-Rowena association has slopes that range to 8 percent. The association occupies about 5 percent of the county. Bonti soils make up about 22 percent of the association, Olton soils about 20 percent, and Rowena soils 10 percent. The remaining 48 percent consists mainly of Callahan, Krum, Lindy, Tobosa, and Valera soils.

Bonti soils are on ridgetops and side slopes. These soils are gently sloping and undulating. They have a brown fine sandy loam surface layer about 8 inches thick. The next layer is 14 inches of red clay loam. The next lower layer is 12 inches of reddish-brown clay loam mottled in shades of red and yellow. The underlying material, extending to a depth of 42 inches, is reddish-yellow sandstone that is weakly cemented in the upper part and strongly cemented in the lower part. The Bonti soils in this association contain buried sandstone fragments and boulders, and in some places these fragments and boulders extend above the surface at intervals of about 20 to 200 feet.

Olton soils are on uplands and are nearly level to gently sloping. These soils have a brown clay loam surface layer about 6 inches thick. The next layer is dark reddish-brown clay to a depth of 16 inches, and reddish-brown clay to a depth of 46 inches. The next lower layer is 20 inches of pink clay loam that is about 50 percent pockets of soft lime and a few concretions of lime. The underlying material, extending to a depth of 108 inches, is pink clay loam containing a few pockets of lime.

Rowena soils are on uplands. They are nearly level to gently sloping. They have a surface layer about 16 inches thick. The upper 6 inches is dark grayish-brown clay loam, and the lower 10 inches is dark grayish-brown clay containing a few lime concretions. The next layer is about 14 inches of dark-brown clay that is about 5 percent lime concretions. The underlying material is pink clay loam to a depth of 50 inches, and from a depth of 50 to 94 inches is light-brown clay that is 10 to 20 percent white, soft lime and lime concretions.

The deeper and less sloping soils of this association are well suited to cultivation. The shallower and stony soils are best suited to range. About half of this association is used for range, and the rest is cultivated. Many kinds of wildlife inhabit this association. Selected areas are suitable for wildlife management and hunting leases.

Deep Soils Formed in Recent or Old Alluvial Sediments

This group of associations makes up about 8 percent of the county. The majority of these soils are suitable for cultivation, range, or wildlife management. Some are best suited to range or wildlife management because of frequent flooding or steepness of slopes.

8. Frio-Olton association

Deep, nearly level to gently sloping, loamy soils formed in old or recent alluvium

This association is made up of soils on flood plains of streams and on the adjoining higher lying stream terraces. Slopes are mostly less than 1 percent in the flood plains but range to about 3 percent on the stream terraces.

This association makes up about 7 percent of the county. Frio soils make up about 52 percent of the association, and Olton soils about 19 percent. The other 29 percent is mainly Abilene, Rowena, and Winters soils.

Frio soils are nearly level soils on flood plains of streams. These soils have a clay loam surface layer 26 inches thick. The upper 12 inches is dark grayish brown, and the lower 14 inches is brown. The next layer is 16 inches of brown clay loam containing a few films, threads, and small lumps of lime. The underlying material, extending to a depth of 60 inches, is brown clay loam.

Olton soils are nearly level to gently sloping soils along and adjacent to flood plains. These soils have a brown clay loam surface layer about 6 inches thick. The next layer is dark reddish-brown clay about 10 inches thick. Below this, and extending to a depth of 46 inches, is reddish-brown clay. The underlying material is pink clay loam that is about 2 percent pockets of soft lime and a few hard lumps of lime. This pink material extends to a depth of 108 inches.

Most of this association is well suited either to cultivation or to range. More than half of it is cultivated. It is well suited to and is inhabited by many kinds of wildlife.

9. Miles-Clairemont-Yahola association

Deep, nearly level to strongly sloping, loamy soils formed in old or recent alluvium

This association is made up of nearly level to gently sloping soils in the flood plains of the Colorado River, the adjoining stream terraces, and the strongly sloping steps above the deeply entrenched river channel. Slopes range from less than 1 percent to about 3 percent in the greater part of the association, and up to 12 percent in the more sloping areas near the river channel.

This association makes up about 1 percent of the county. Miles soils cover about 32 percent of the association, Clairemont soils 30 percent, and Yahola soils 26 percent. The other 12 percent is mostly Sarita soils.

Miles soils are on terraces and are nearly level to gently sloping. These soils have a reddish-brown fine sandy loam surface layer about 6 inches thick. The next layer, extending to a depth of 84 inches, is sandy clay loam. It is reddish brown in the upper 8 inches and red in the lower 70 inches. The underlying material, extending to a depth of 96 inches, is a light-red fine sandy loam. It contains a few concretions and soft lumps of lime and is about 5 percent siliceous pebbles.

Clairemont soils are on parts of the flood plains and parts of the strongly sloping steps above the river channels. These soils are nearly level to gently sloping. They have a reddish-brown silt loam surface layer 6 inches thick. The underlying material, extending to a depth of 66 inches, is reddish-brown silt loam marked by weak bedding planes and thin strata in the lower part.

Yahola soils are nearly level to gently sloping. They are on parts of flood plains and on parts of the strongly sloping steps above the river channels.

Yahola soils have a brown fine sandy loam surface layer about 5 inches thick. The underlying material, extending to a depth of 60 inches, is fine sandy loam. The first 11 inches is brown; the next 10 inches is reddish brown; and the last 34 inches is reddish yellow and has faint bedding planes.

Most of the gently sloping areas of this association are well suited to cultivation. About 30 percent of the association is best suited to range because of flooding or steepness of slope. More than two-thirds of the association is in range. Selected areas can be used for wildlife and developed for hunting, fishing, camping, or similar recreation.

Descriptions of the Soils

This section describes the soil series and mapping units in Coleman County. Each soil series is described in considerable detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first, is brief and in terms familiar to the layman. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils. Unless it is otherwise stated, the colors given in the descriptions are those of a dry soil.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Badland, for example, does not belong to a soil series, but nevertheless, is listed in alphabetic order, according to intensity mapped, along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit

on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and range site in which the mapping unit has been placed. The page for the description of each capability unit, range site, or other interpretative group can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*7*).[1]

Abilene Series

The Abilene series consists of deep, nearly level to gently sloping soils in valleys or on plains. These soils formed in loamy to clayey old alluvium. The original vegetation was open prairie grass.

In a representative profile, the surface layer is dark grayish-brown, noncalcareous clay loam about 6 inches thick. The next layer in sequence from the top is 5 inches of very dark grayish-brown clay loam, 19 inches of dark grayish-brown clay, and 10 inches of dark-brown clay. The underlying material, extending to a depth of 80 inches, is very pale brown clay loam. The upper part of this material, between depths of 40 and 70 inches, is a prominent zone of calcium carbonate accumulation.

These soils are well drained. Permeability is moderately slow, and their available water capacity is high.

Abilene soils are well suited to crops, and most areas are cultivated.

Representative profile of Abilene clay loam, 0 to 1 percent slopes, in a cultivated field, 300 feet south and 150 feet west of the intersection of two county roads. The site is approximately 1.6 miles north and 85° east of the Coleman County Courthouse in Coleman.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; hard, firm; the lower inch is a plowpan; few chert pebbles; mildly alkaline; abrupt, smooth boundary.

B1—6 to 11 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) when moist; moderate, fine, subangular blocky structure; hard, firm; some angular peds; clay films; ped surfaces dull; moderately alkaline; clear, smooth boundary.

B2t—11 to 30 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; moderate, fine and medium, blocky structure; very hard, very firm; clay films; ped surfaces shiny; moderately alkaline; gradual, wavy boundary.

B3—30 to 40 inches, dark-brown (10YR 4/3) clay, dark brown (10YR 3/3) when moist; weak to moderate, medium, blocky structure; very hard, very firm; common con-

[1] Italic numbers in parentheses relate to Literature Cited, p. 68.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent
	Acres	*Percent*
Abilene clay loam, 0 to 1 percent slopes	5, 130	0. 6
Abilene clay loam, 1 to 3 percent slopes	2, 639	. 3
Badland	562	. 1
Bonti fine sandy loam, 1 to 3 percent slopes	2, 076	. 3
Bonti soils, undulating	9, 463	1. 2
Bonti and Owens soils, undulating	4, 294	. 5
Callahan loam, 1 to 3 percent slopes	2, 510	. 3
Callahan clay loam, 1 to 3 percent slopes	1, 772	. 2
Clairemont silt loam	1, 976	. 2
Clairemont silty clay loam, clayey variant	739	. 1
Frio clay loam	24, 535	3. 0
Frio clay loam, frequently flooded	32, 002	3. 9
Hilgrave gravelly loam, clayey variant, 1 to 3 percent slopes	383	([1])
Kavett silty clay, 1 to 3 percent slopes	42, 438	5. 2
Kavett and Talpa soils, undulating	57, 757	7. 0
Kimbrough and Mereta soils, undulating	12, 487	1. 5
Krum clay loam, 1 to 3 percent slopes	15, 010	1. 8
Krum clay loam, 3 to 5 percent slopes	1, 719	. 2
Lindy clay loam, 0 to 1 percent slopes	1, 085	. 1
Lindy clay loam, 1 to 3 percent slopes	19, 478	2. 4
Menard fine sandy loam, 1 to 3 percent slopes	4, 889	. 6
Menard fine sandy loam, 1 to 5 percent slopes, eroded	7, 741	1. 0
Menard-Weymouth complex, 1 to 5 percent slopes, eroded	10, 936	1. 3
Mereta clay loam, 1 to 3 percent slopes	7, 124	. 9
Miles fine sandy loam, 1 to 3 percent slopes	3, 206	. 4
Nuvalde clay loam, 0 to 1 percent slopes	1, 942	. 2
Nuvalde clay loam, 1 to 3 percent slopes	11, 661	1. 4
Olton clay loam, 0 to 1 percent slopes	5, 854	. 7
Olton clay loam, 1 to 3 percent slopes	25, 333	3. 1
Owens clay, 1 to 3 percent slopes	518	. 1

Soil	Area	Extent
	Acres	*Percent*
Pedernales loamy fine sand, 1 to 3 percent slopes	800	0. 1
Pedernales fine sandy loam, 1 to 3 percent slopes	4, 254	. 5
Pedernales fine sandy loam, 1 to 3 percent slopes, eroded	4, 367	. 5
Purves and Owens soils, undulating	47, 740	5. 8
Rowena clay loam, 0 to 1 percent slopes	16, 012	2. 0
Rowena clay loam, 1 to 3 percent slopes	26, 746	3. 3
Sarita loamy fine sand, 1 to 5 percent slopes	600	. 1
Somervell-Stony land complex, moderately steep	5, 161	. 6
Speck clay loam, 1 to 3 percent slopes	6, 022	. 7
Speck and Tarrant soils, undulating	26, 968	3. 3
Stony land and Owens soils, moderately steep	55, 680	6. 8
Tarrant soils, undulating	29, 378	3. 6
Tarrant and Purves soils, undulating	143, 712	17. 5
Tobosa clay, 0 to 1 percent slopes	14, 365	1. 8
Tobosa clay, 1 to 3 percent slopes	69, 559	8. 5
Valera clay, 1 to 3 percent slopes	29, 772	3. 6
Weymouth loam, 1 to 3 percent slopes	892	. 1
Weymouth-Portales complex, 1 to 3 percent slopes	2, 916	. 4
Weymouth and Menard soils, undulating	8, 423	1. 0
Winters fine sandy loam, 0 to 1 percent slopes	874	. 1
Winters fine sandy loam, 1 to 3 percent slopes	2, 259	. 3
Yahola fine sandy loam	874	. 1
Yahola and Clairemont soils, strongly sloping	2, 835	. 3
Total land area	817, 468	99. 6
Water	3, 012	. 4
Total acreage	820, 480	100. 0

[1] Less than 0.05 percent.

cretions and soft lumps of calcium carbonate; moderately alkaline; calcareous; gradual, wavy boundary.

C1ca—40 to 70 inches, very pale brown (10YR 7/4) clay loam, light yellowish brown (10YR 6/4) when moist; massive; hard, firm; about 60 percent calcium carbonate equivalent; few concretions of calcium carbonate; few caliche-coated limestone pebbles; gradual, smooth boundary.

C2—70 to 80 inches, very pale brown (10YR 7/4) stratified clay loam, light yellowish brown (10YR 6/4) when moist; massive; hard, firm; about 10 percent segregated white lime; calcareous.

The A horizon ranges from about 6 to 10 inches in thickness, from grayish brown to dark brown in color, and from neutral to moderately alkaline in reaction.

The B horizon ranges from about 22 to 38 inches in thickness and from brown to very dark grayish brown in color. The accumulation of soft secondary carbonate begins at depths ranging from 27 to 44 inches.

The C horizon is loamy to clayey, old alluvial sediments.

The Abilene soils in Coleman County are outside the range defined for the series because they lack soft secondary carbonates within 24 inches of the surface, but this difference does not alter their usefulness or behavior.

Abilene clay loam, 0 to 1 percent slopes (AbA).—This nearly level soil is on plains and in shallow valleys. Mapped areas range from about 20 to 400 acres in size and are irregularly rounded to oblong in shape.

This soil has the profile described as representative for the Abilene series.

Included in the larger mapped areas of this soil are small rounded spots of Rowena clay loam that range from a few feet to about 300 feet across, and a few elongated areas of Olton clay loam. These inclusions are less than 5 acres in size and make up less than 10 percent of the total acreage. Small drainageways and adjacent strips that are as much as 200 feet in width, and subject to overflow, form up to 10 percent of the smaller mapped areas of this soil.

Most areas of this Abilene clay loam are cultivated; some areas are in range. Erosion is not a major hazard. Capability unit IIc-3; Deep Upland range site.

Abilene clay loam, 1 to 3 percent slopes (AbB).—This gently sloping soil is in shallow valleys. Mapped areas are mostly elongated and are along small natural drains. They average about 50 acres in size.

The surface layer or plow layer is dark grayish-brown clay loam about 6 inches thick. The next layer is brown clay loam about 22 inches thick. The underlying material, extending to a depth of about 60 inches, is very pale brown clay loam.

Mapped with this soil are a few areas where the surface layer has been thinned through water erosion, and a few places where shallow gullies have formed. Another inclusion is a few small spots that have a fine sandy loam overwash. As much as 10 percent of some mapped areas along small drains is made up of the stream channel and adjacent strips that are overflowed. In some mapped areas, Rowena clay loam is intermixed with the Abilene clay loam.

The areas of this Abilene clay loam are well suited to crops. Capability unit IIe-2; Deep Upland range site.

Badland

Badland (BA) consists of shales and clays in elongated or irregularly shaped areas about 10 to 80 acres in size. This Badland mapping unit is made up of steep escarpments and gently sloping, severely eroded areas. The areas consist mainly of gullies, slumps, and slips caused by erosion of the banks of drainageways, and a few areas of exposed limestone, exposed sandstone, or both. In the more gently sloping areas there are broad shallow gullies.

About 70 percent of a typical area consists of shales and clays that are unweathered or are slightly weathered in the upper few inches. The composition is more variable than most other mapping units in the county, but mapping was detailed enough to interpret for the expected uses of the land. Badland supports only widely scattered plants. At the bottom of some gullies and in small alluvial fans, an accumulation of clayey to loamy alluvial sediments supports scattered clumps of mid and short grasses, brush, and cactus.

The severe damage from erosion makes the areas of Badland unsuitable for grazing. These areas are best suited to wildlife and recreation. Ponds can be dug in some places, but the large amount of sediment that washes from the areas is a problem. This sediment damages water facilities and land downstream. Protecting Badland from livestock and establishing and maintaining vegetation help to stabilize these areas and reduce erosion. Capability unit VIIIs-1; not in a range site.

Bonti Series

The Bonti series consists of moderately deep, loamy and sandy soils that are gently sloping to sloping. These soils are on ridgetops and side slopes in undulating areas.

In a representative profile, the surface layer is brown, neutral fine sandy loam about 8 inches thick. The next layer is red, medium acid clay loam in the upper 14 inches and reddish-brown clay loam in the lower 12 inches. Below this, and extending to a depth of 42 inches, is weakly cemented sandstone (fig. 2).

The Bonti soils have a high available water capacity. The erosion hazard is moderate, and permeability is moderately slow. These soils are well drained.

Representative profile of Bonti fine sandy loam, 1 to 3 percent slopes, 100 feet east and 60 feet north of a wire gate between a county road and a private road, which is 3.3 miles west of Burkett, Tex., on Farm Road 2806, then 1.2 miles west on the county road to the private road. The site is approximately 14 miles north and 36° east of the Coleman County Courthouse in Coleman.

A1—0 to 4 inches, brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) when moist; weak, fine subangular blocky structure; slightly hard, very friable; neutral; abrupt, smooth boundary.

A2—4 to 8 inches, brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) when moist; weak, medium, subangular blocky structure; slightly hard, very friable; slightly acid; clear, smooth boundary.

B21t—8 to 22 inches, red (2.5YR 4/6) clay loam, same color when moist; moderate, fine, blocky structure; very hard, very firm; nearly continuous clay films on ped surfaces; few small sandstone pebbles; medium acid; gradual, smooth boundary.

B22t—22 to 34 inches, reddish-brown (2.5YR 4/4) clay loam, same color when moist; common, medium, distinct, red and yellow mottles that are fine sandy loam in texture; moderate, fine, blocky structure; very hard, very firm; few, small, weakly cemented sandstone fragments; nearly continuous clay films on ped surfaces; medium acid; abrupt, smooth boundary.

Figure 2.—**Profile of Bonti fine sandy loam.**

R—34 to 42 inches, reddish-yellow, weakly cemented sandstone; strongly cemented in lower part.

The A horizon ranges from light brown to yellowish brown in color, from fine sandy loam to loamy fine sand in texture, and from 4 to 10 inches in thickness.

The Bt horizon ranges from reddish brown to red in color, from clay loam to clay or sandy clay in texture, and from 35 to 45 percent clay.

Depth to sandstone is 20 to 40 inches. Sandstone fragments in the soil range from a few to about 35 percent, by volume.

Bonti fine sandy loam, 1 to 3 percent slopes (BoB).—This soil is in irregularly shaped areas 20 to 100 acres in size. Most cultivated areas or old fields retired from cultivation show a few spots where the surface layer has been thinned by erosion or mixed with a lower layer by plowing. Scattered shallow gullies have formed in some fields. Where terraces are built, sandstone fragments as much as a foot or more across are unearthed and left exposed on the terraces.

This soil has the profile described as representative for the Bonti series.

Included with this soil in mapping is a soil in rounded or oval areas less than an acre in size that is less than 20 inches deep over sandstone. These areas make up less than 5 percent of any mapped area. About 2 percent of some mapped areas is soils having clay layers over shaly clay. These areas are mainly on the lower side slopes. Another inclusion is a soil that is more than 40 inches deep over sandstone and has a loamy fine sand surface layer about 18 inches thick. All of these inclusions make up about 10 percent of the acreage.

About half the acreage of this Bonti fine sandy loam has been cultivated. Some fields have been returned to pasture or range. Capability unit IIIe–6; Sandy Loam range site.

Bonti soils, undulating (BNB).—The soils in this mapping unit formed in old channel deposits. The underlying sandstone ranges from a few inches to many feet in thickness. Slopes are undulating and dominantly less than 3 percent, but they range to 8 percent in the steeper parts of the undulating terrain.

Areas of this mapping unit are from about 20 to 3,000 acres in size. The smaller areas are mostly oval shaped. The larger ones are irregular and reach 2 miles in width.

The composition of this mapping unit is more variable than most other mapping units in the county, but mapping was detailed enough to interpret for the expected uses of the soils. About 55 percent of this mapping unit is Bonti soils, 20 percent shallow soils that do not have a clayey lower layer, and 15 percent soils that are like Bonti but have sandstone at depths of less than 20 inches.

In some valley positions at or near the heads of small local drainageways, Pedernales fine sandy loam, in areas as much as 6 acres in size, makes up about 3 percent of this mapping unit.

Other included soils are mainly Owens clay or stony clay, and soils like the Bonti but underlain by shaly clay instead of sandstone. These included soils occupy narrow strips on side slopes and make up about 6 percent of the mapping unit. Strips of outcropping bedrock account for about 1 percent of the unit.

These Bonti soils have a surface layer of brown fine sandy loam about 4 inches thick. The next layer is about 20 inches of red clay loam that is as much as 35 percent sandstone fragments. The underlying material is weakly cemented sandstone.

Fragments a foot or more across extend above the surface at intervals of 50 to 200 feet where slopes are less than 3 percent. In the steeper areas, sandstone outcrops at intervals of 20 to 50 feet. The texture of surface layers ranges from fine sandy loam to loamy fine sand. These soils are intermixed, but in a large part, the shallow soils are on the steeper slopes or are near narrow strips of outcropping sandstone. Parts of the broader ridgetops have areas of Bonti soils as much as 12 acres in size that are nearly free of sandstone fragments on the surface.

Most of this mapping unit is in range. Capability unit VIe–3; Sandstone Hills range site.

Bonti and Owens soils, undulating (BWB).—The composition of this mapping unit is more variable than that of most others in the county, but mapping was detailed enough to interpret for the expected uses of the soils.

The areas of this mapping unit are irregularly shaped and range from about 30 to 150 acres in size. Slopes range from 1.5 to 8 percent. Outcrops of sandstone or partly buried sandstone boulders are at intervals of 20 to 200 feet over most of a mapped area.

A typical area is made up of about 30 percent Bonti soils; 20 percent Owens soils; and 20 percent soils like the Bonti except they are not so red and have shale at

a depth of 40 inches instead of sandstone. Soils like the Bonti, except for the presence of sandstone at depths of less than 20 inches, account for another 15 percent of the unit. The remaining 15 percent consists of a few spots of fine sandy loam or loamy fine sand that is 20 inches deep and directly overlies sandstone.

Bonti soils mainly are on the ridgetops and higher elevations, but they are intermixed with the Owens and other soils on the side slopes. In many places, side slopes are formed by the component soils in bands 50 to 200 feet wide. The surface layer of the Bonti soils is brown fine sandy loam about 4 inches thick. Next is a layer of red clay loam that is about 20 inches thick and is as much as 35 percent sandstone fragments. The underlying material is weakly cemented sandstone.

The Owens soils have a light olive-brown, clayey surface layer about 6 inches thick. The next layer is olive-brown clay about 8 inches thick. The underlying material, extending to a depth of 28 inches, is shaly clay. Pedernales fine sandy loam, in areas less than 5 acres in size, is in some of the valleys of small drainageways.

The soils of this mapping unit are best suited to grass and are used for range. These soils are moderately slowly permeable to very slowly permeable. Runoff is medium to rapid, and the erosion hazard is moderate to high. Both the Bonti and Owens soils in capability unit VIe–3; Bonti part in Sandstone Hills range site; Owens part in Shaly Hills range site.

Callahan Series

The Callahan series consists of deep, loamy soils on uplands. Slopes are plane to convex and range from about 1 to 3 percent.

In a representative profile, the surface layer is reddish-brown loam about 7 inches thick. The next layer is mainly reddish-brown clay about 29 inches thick. It is yellowish red in the lower 6 inches. The underlying material, extending to a depth of about 70 inches, is yellow silty clay loam containing partially weathered shale.

The Callahan soils are well drained and are slowly permeable. They have high available water capacity. The erosion hazard is moderate.

Most of the acreage has been cultivated, but some old fields have been returned to range.

Representative profile of Callahan loam, 1 to 3 percent slopes, in a cultivated field, 50 feet south of U.S. Highway Nos. 67 and 84, from a point 0.2 mile west of the Brown and Coleman County line. This site is approximately 15 miles south and 61° east of the Coleman County Courthouse in Coleman:

Ap—0 to 7 inches, reddish-brown (5YR 4/4) loam, dark reddish brown (5YR 3/4) when moist; massive; hard, firm; 0.25 inch crust on surface; noncalcareous; mildly alkaline; clear, smooth boundary.

B21t—7 to 18 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) when moist; moderate, fine, blocky structure; very hard, very firm; ped surfaces slightly darker than crushed color; 6 percent small siliceous pebbles; noncalcareous; mildly alkaline; clear, smooth boundary.

B22t—18 to 30 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) when moist; moderate, very fine and fine, blocky structure; very hard, very firm; clay films on peds; less than 2 percent small siliceous pebbles; few calcium carbonate concretions; calcareous; moderately alkaline; gradual, wavy boundary.

B3—30 to 36 inches, yellowish-red (5YR 5/6) clay, yellowish red (5YR 4/6) when moist; weak, medium, blocky structure; hard, firm; patchy clay films; 10 percent partially weathered shale fragments; few calcium carbonate concretions; calcareous; moderately alkaline; gradual, smooth boundary.

C—36 to 70 inches, yellow (2.5Y 7/6) silty clay loam, olive yellow (2.5Y 6/6) when moist; thin lenses and strata of pink (7.5YR 7/4) partially weathered shale; massive; hard, firm; few concretions and masses of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 30 to 60 inches in thickness. Accumulation of secondary carbonates begins at depths of 12 to 24 inches. Siliceous pebbles range from a few to as much as 10 percent, by volume, of the soil.

The A horizon ranges from reddish brown to brown in color and from about 4 to 10 inches in thickness. Structure ranges from massive to subangular blocky and granular. Consistence is hard to very hard, and reaction is neutral to moderately alkaline.

The B horizon ranges from reddish brown to yellowish red in color and from neutral to moderately alkaline in reaction.

The C horizon ranges from thin stratified layers of calcareous fine earth and partially weathered shale containing thin lenses and strata of sandstone to calcareous, loamy, valley-fill sediments.

Callahan loam, 1 to 3 percent slopes (CaB).—This gently sloping soil is on uplands. Soil areas are irregularly shaped and mostly about 30 to 100 acres in size. Slopes are dominantly 1.25 to 2 percent.

This soil has the profile described as representative for the Callahan series.

Mapped with this soil are small rounded areas of Owens clay. These areas are 1 to 2 acres in size and are predominantly on slight rises. Similarly sized, slightly depressed areas of Tobosa clay also are included. These inclusions make up about 3 percent of the acreage. Capability unit IIe–2; Deep Upland range site.

Callahan clay loam, 1 to 3 percent slopes (CcB).—This soil is in valleys in irregular areas that average about 60 acres in size. Slopes are mostly 1.5 to 2 percent.

The surface layer is about 6 inches of dark-brown clay loam that is massive and hard. The next layer is about 34 inches of reddish-brown clay that is yellowish red in the lower part. The underlying material, extending to a depth of about 60 inches, is calcareous clay loam that contains calcium carbonate concretions and siliceous pebbles.

Mapped with this soil at lower elevations are areas of Abilene clay loam as much as 3 acres in size. Making up about 5 percent of the acreage are areas of Rowena clay loam similar in size to those of Abilene clay loam. Also mapped in some areas are one or more rounded to oblong areas of Weymouth loam at the tops of ridges, and of Portales loam on the sides of the ridges. These areas range from about 0.1 acre to 2 acres in size and make up about 5 percent of the mapped areas. Capability unit IIe–2; Deep Upland range site.

Clairemont Series

The Clairemont series consists of calcareous soils that formed in reddish alluvium. These nearly level soils are on flood plains and on steps above drainageways.

In a representative profile, the surface layer is reddish-brown silt loam about 6 inches thick. The underlying material, extending to a depth of 66 inches, is reddish-brown silt loam that is stratified at lower depths.

These Clairemont soils are well drained, and their permeability is moderate. They are subject to occasional to frequent flooding, and their available water capacity is high.

Representative profile of Clairemont silt loam in a cultivated field 100 feet west of a road fence, which is about 4 miles southwest of Rockwood, Tex., on a county road to the Waldrip Bridge over the Colorado River, then 1,350 feet north of the bridge. The site is approximately 25.2 miles south and 1° east of the Coleman County Courthouse in Coleman:

Ap—0 to 6 inches, reddish-brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) when moist; weak, very fine, granular structure; hard, friable; lower 2 inches is part of a somewhat compacted plowpan layer; calcareous; moderately alkaline; abrupt, smooth boundary.

C1—6 to 16 inches, reddish-brown (5YR 5/4) silt loam, reddish brown (5YR 4/3) when moist; massive; hard, friable; upper 2 inches is part of a compacted plowpan layer; slightly more clay than in the Ap horizon; few worm casts and fine pores; few threads of lime in the lower part; calcareous; moderately alkaline; gradual, smooth boundary.

C2—16 to 42 inches, reddish-brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) when moist; massive; hard, friable; slightly less clay than the C1 horizon; weak bedding planes in the lower part; films and threads of whitish lime on about 2 percent of broken surfaces; calcareous; moderately alkaline; gradual, smooth boundary.

C3—42 to 66 inches, reddish-brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) when moist; massive; hard, friable; contains thin strata of loam and silty clay loam; calcareous.

The A horizon ranges from reddish brown or brown to yellowish red in color and from 4 to 12 inches in thickness.

The C horizon ranges from reddish brown to reddish yellow in color. The average texture of the layers between depths of 10 and 40 inches is very fine sandy loam to silty clay loam, and the clay content is 18 to 35 percent.

Clairemont silt loam (Cm).—This nearly level soil is on flood plains in elongated to irregular areas 30 to 350 acres in size. Slopes are dominantly about 0.5 percent.

This soil has the profile described as representative for the Clairemont series.

This Clairemont silt loam is well suited to most crops that are grown in the county. Capability unit IIc-2; Bottomland range site.

Clairemont Series, Clayey Variant

This variant of the Clairemont series consists of calcareous soils that formed in recent materials. These materials were derived from nearby eroded, sloping areas of shaly clay.

In a representative profile, the surface layer is reddish-brown silty clay loam about 7 inches thick. The next layer, to a depth of 16 inches, is dark reddish-brown silty clay stratified with loam. Between depths of 16 and 60 inches, it is dark reddish-brown or reddish-brown clay stratified with clay loam.

These soils are well drained, and their permeability is slow. They have high available water capacity.

Representative profile of Clairemont silty clay loam, clayey variant, in range, 500 feet southeast of a point on a county road and 180 feet down the slope from a small stock tank. The point on the county road is 1.2 miles east of the intersection of Farm Road 568 and the county road, and approximately 12.6 miles north and 85° east of the Coleman County Courthouse in Coleman:

A1—0 to 7 inches, reddish-brown (5YR 5/3) silty clay loam, reddish brown (5YR 4/3) when moist; moderate, fine, platy structure; hard, friable; thin strata of loam; few fragments of shaly clay; calcareous; moderately alkaline; abrupt, smooth boundary.

C1—7 to 16 inches, dark reddish-brown (5YR 3/3) silty clay, dark reddish brown (5YR 3/3) when moist; massive; hard, firm; few roots; weakly stratified with loam; few films of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

C2—16 to 26 inches, dark reddish-brown (5YR 3/3) clay, dark reddish brown (5YR 3/3) when moist; massive; hard, firm; weakly stratified with clay loam; few small concretions of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

C3—26 to 60 inches, reddish-brown (5YR 5/3) clay, reddish brown (5YR 4/3) when moist; massive; hard, firm; calcareous; moderately alkaline.

The A horizon ranges from reddish brown to brown in color and from 4 to 13 inches in thickness.

The C horizon ranges from dark reddish brown to brown in color. The texture of the layers between depths of 10 and 40 inches normally is silty clay loam to clay, and the clay content is 35 to 60 percent.

Clairemont silty clay loam, clayey variant (Cn).—This soil is below sloping areas of shaly clay that have been eroded. Soil areas are along small creeks or drainageways and are 200 to 500 feet in width. Slopes are dominantly about 0.75 percent, but range from about 0.5 to 2 percent. This soil is outside the range of the Clairemont series in that its clay content between depths of 10 and 40 inches averages more than 35 percent.

In a representative profile, this soil consists of shaly clay sediments that are stratified with loam and clay loam. In some places, the profile contains streaks of more sandy material.

The sediments are recently deposited, and the areas are subject to periodic overflow carrying fresh deposits. The sealing effect of the shaly clay sediments at the surface is so great that dry soil commonly is just below the surface, even after a rain of high intensity.

Nearly all the acreage of this Clairemont silty clay loam, clayey variant, is in range. It is best suited to grasses, but parts of some areas could be cultivated if they were protected from flooding and damaging sediments. Capability unit Vw-1; Bottomland range site.

Frio Series

The Frio series consists of calcareous, nearly level soils on the flood plains of streams.

In a representative profile, the surface layer is clay loam that is dark grayish brown in the upper 12 inches and brown in the lower 14 inches. Below this, and extending to a depth of 60 inches, is brown clay loam.

These soils are well drained, and their permeability is moderately slow. Their available water capacity is high.

Representative profile of Frio clay loam, in native range, 35 feet north of a ranch trail, 1,200 feet west of the trail's junction with a county road, at a turn in the

road which is about 3 miles southwest of Burkett, Tex., on Farm Road 206, then 4.5 miles west and north on Farm Road 2806 to an intersection with a county road, then west on the county road 0.4 mile. This site is approximately 19.6 miles north and 30° east of the Coleman County Courthouse in Coleman:

A11—0 to 12 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine and very fine, subangular blocky structure; hard, firm; weak, platy crust on surface is about 0.5 to 1.0 inch thick and of loam texture; few worm and insect channels; few worm casts; calcareous; moderately alkaline; gradual, smooth boundary.

A12—12 to 26 inches, brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; moderate, fine and very fine, subangular blocky and blocky structure; hard, firm; few worm and termite channels; few worm casts; calcareous; moderately alkaline; gradual, smooth boundary.

B2—26 to 42 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) when moist; moderate, fine and very fine, subangular blocky and blocky structure; hard, firm; few films and threads of calcium carbonate and small lumps of lime (less than 1 percent segregated lime); few fine and medium pores; few worm casts; calcareous; moderately alkaline; gradual, smooth boundary.

C—42 to 60 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) when moist; weak, fine, blocky structure; hard, firm; few threads, films, and small lumps of lime (less than 1 percent); calcareous; moderately alkaline.

The solum ranges from about 36 to 50 inches in thickness and contains from less than 1 to 35 percent, by volume, pebbles and cobbles.

The A horizon ranges from very dark grayish brown to brown in color and from 20 to 50 inches in thickness.

Where there is a B horizon, it is brown to light brown.

Frio clay loam (Fo).—Areas of this soil range in size from about 10 acres in a few areas to several hundred acres along some of the larger streams. The areas range from about 200 feet wide to a mile wide in places along the larger streams. Slopes are dominantly about 0.4 to 0.7 percent.

This soil has the profile described as representative for the Frio series.

Mapped with this soil are stream channels, streambanks, stony areas, and frequently overflowed soils. These areas are too small or too narrow to be shown on a map of the scale used for this survey, but they account for as much as 10 percent of the acreage of Frio clay. Other inclusions are areas that have a surface layer and lower layers more sandy than those of Frio soils. These areas are typically slight, elongated ridges that parallel the stream channel and are 3 to 5 acres in size.

This Frio clay loam is well suited to cultivation, and about half of the acreage is cultivated. Although seldom overflowed, this soil is covered by slowing moving water for short periods when it is flooded. Capability unit IIc–2; Bottomland range site.

Frio clay loam, frequently flooded (Fr).—This soil is mainly in the flood plains of the smaller streams. Soil areas are elongated and 10 to 300 acres in size. Slopes are mostly less than 1 percent but some short slopes are as much as 2 percent. Slopes are undulating and, in most areas, are interrupted by stream channels. The flood plains typically have two or more shallow channels. A few have fairly deep channels that meander and cut the plain into areas so small and difficult to reach that it is not practical to cultivate them.

This Frio soil has a surface layer of dark grayish-brown clay loam that is about 40 inches thick. The underlying material, extending to a depth of 60 inches, is brown clay loam.

Mapped with this soil are areas of stratified soils that are similar to Frio clay loam but have layers ranging from clay loam to loam in texture. These are near the channels and make up about a third of the acreage. In some mapped areas, limestone outcrops intermittently in the channels, and in other places limestone fragments extend across the flood plain. These stony, gravelly, and cobbly areas make up about 10 percent of the acreage.

This Frio clay loam is subject to frequent damaging overflow, and the swiftly moving water causes much scouring if the soil is not protected by vegetation. Damaging floods occur once or twice a year.

Almost all of the acreage of this soil is in range. Some areas were once cultivated but now have returned to range. Flood-control structures and channel improvements would make it possible to cultivate some areas, but most areas are best suited to range. Capability unit Vw–1; Bottomland range site.

Hilgrave Series, Clayey Variant

The Hilgrave series consists of loamy soils that are gravelly or very gravelly below the surface layer.

These gently sloping soils are on uplands. Slopes are mainly convex and dominantly about 2 percent. These soils formed in thin layers of old alluvium at the edge of stream terraces or in the gravelly basal remnants of old alluvium.

In a representative profile, the surface layer is reddish-brown gravelly loam about 8 inches thick. The next layer is reddish-brown very gravelly clay that is about 75 percent siliceous pebbles in the upper 8 inches. The lower 34 inches is yellowish-red gravelly clay loam. The underlying material, extending to a depth of about 64 inches, is shaly clay.

These soils are well drained, and their available water capacity is moderate. Permeability is moderately slow.

These Hilgrave soils are used mostly for range, although a few small areas are in cultivated fields. Selected areas are suitable sources for roadbuilding materials, and some gravel pits have been dug.

Representative profile of Hilgrave gravelly loam, clayey variant, 1 to 3 percent slopes, 450 feet south of a point on a county road that is 1.25 miles northwest of Goldsboro, Tex., and 400 feet east of U.S. Highway 84. This site is approximately 23.1 miles north and 43° west of the Coleman County Courthouse in Coleman:

A1—0 to 8 inches, reddish-brown (5YR 4/4) gravelly loam, dark reddish brown (5YR 3/4) when moist; weak, fine, granular structure; slightly hard, friable; about 18 percent siliceous pebbles; calcareous; moderately alkaline; clear, smooth boundary.

B2t—8 to 16 inches, reddish-brown (5YR 4/4) very gravelly clay, dark reddish brown (5YR 3/4) when moist; weak, fine, blocky structure; hard, firm; about 75 percent, by volume, siliceous pebbles that are dominantly less than 1 inch in width; noncalcareous; moderately alkaline; clear, wavy boundary.

B3ca—16 to 50 inches, yellowish-red (5YR 5/6) gravelly clay loam, yellowish red (5YR 4/6) when moist; massive;

hard, friable; few roots; about 50 percent white, soft caliche; about equal volume of intermixed, siliceous and limestone pebbles; abrupt, smooth boundary.

IIC—50 to 64 inches, light olive-brown to reddish shaly clay; massive; hard, friable; about 15 percent pockets and streaks of white lime; calcareous; moderately alkaline.

The A horizon ranges from brown to reddish brown in color, from 4 to 8 inches in thickness, and from neutral to moderately alkaline in reaction. The A horizon is 15 to 35 percent pebbles.

The B horizon ranges from reddish brown to strong brown in color, from 16 to 42 inches in thickness, and from neutral to moderately alkaline in reaction. This horizon is 35 to 80 percent siliceous pebbles and is clay loam to clay in the spaces between the pebbles.

The Cca horizon is 20 to 70 percent water-rounded siliceous and limestone pebbles.

This Hilgrave soil is 20 to 50 inches thick and overlies shaly clay or limestone. The depth to accumulations of secondary lime ranges from 16 to 24 inches.

Hilgrave gravelly loam, clayey variant, 1 to 3 percent slopes (HgB).—This soil is in elongated to irregular areas 10 to 50 acres in size. Included with this soil in mapping are areas of similar soils that are less than 35 percent pebbles in the lower layer. These areas account for 10 to 15 percent of the acreage. Soils in 20 to 30 percent of some mapped areas are calcareous throughout but are otherwise similar to the Hilgrave soil. The inclusions are intermixed, and soil layers vary in texture and depth within short distances. Capability unit IVs-1; Tight Sandy Loam range site.

Kavett Series

The Kavett series consists of calcareous, clayey soils that are shallow and overlie strongly cemented caliche and limestone. These soils are gently sloping to sloping and are on uplands. Limestone fragments are on the surface in most areas.

In a representative profile, the surface layer is dark grayish-brown silty clay in the upper 9 inches and brown silty clay in the lower 8 inches. The underlying material, extending to a depth of about 24 inches, is caliche-coated limestone fragments and hard limestone (fig. 3).

These soils are well drained, and their permeability is moderately slow. Because of the shallow soil, the available water capacity is low. The erosion hazard is moderate to high.

Representative profile of Kavett silty clay, 1 to 3 percent slopes, in a cultivated field, 90 feet west of a point on U.S. Highway 283, which is 2 miles north of Coleman, Tex., on Texas Highway 206, then 3.4 miles north on U.S. Highway 283 from its intersection with U.S. Highway 84 and Texas Highway 206. This site is approximately 5 miles north and 10° east of the Coleman County Courthouse in Coleman:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; hard, firm; about 8 percent limestone and chert pebbles and less than 1 percent limestone cobbles on the soil surface; less than 2 percent limestone and chert pebbles in the soil; few worm casts; calcareous; moderately alkaline; abrupt, smooth boundary.

A11—6 to 9 inches, dark grayish-brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) when moist; moderate, very fine, subangular blocky structure; hard, firm; less than 2 percent chert and limestone pebbles; few worm casts; calcareous; moderately alkaline; clear, smooth boundary.

Figure 3.—Soil profile of Kavett silty clay.

A12—9 to 17 inches, brown (10YR 5/3) silty clay, dark brown (10YR 4/3) when moist; moderate, very fine, subangular blocky structure; hard, firm; about 7 percent limestone pebbles as much as 3 inches in diameter; about 3 percent caliche-coated limestone cobbles; calcareous; moderately alkaline; abrupt, irregular boundary.

Ccam—17 to 23 inches, limestone fragments, 6 to 18 inches in width, strongly cemented by caliche.

R—23 to 24 inches, hard marine limestone.

Depth of the soil to cemented caliche and limestone ranges from 10 to 20 inches. The amount of limestone fragments in the soil profile ranges from few to about 35 percent. The A horizon ranges from very dark grayish brown to brown. The Ccam horizon is hard, caliche-coated limestone or caliche-cemented limestone rubble.

Kavett silty clay, 1 to 3 percent slopes (KvB).—This gently sloping soil is on benches and smooth plains in areas 20 to 150 acres in size. The areas are irregular in shape or are in narrow strips along drains on bordering limestone outcrops. Slopes are mainly 1 to 2 percent but range to 3 percent in a few places. In most areas a

few limestone fragments as much as 6 inches wide are on the surface of this soil.

This soil has the profile described as representative for the Kavett series.

Mapped with this soil are patches from about 50 feet in width to an acre or more in size that have as much as 10 percent of the surface covered with limestone pebbles and cobbles. Also included in larger mapped areas are Tarrant soils. These soils are in areas as much as 3 acres in size and form as much as 5 percent of the acreage in some places. Other inclusions are intermixed pockets and strips of soils that are more than 20 inches deep over limestone or that are underlain by marly clay instead of limestone. These inclusions make up 25 percent of some mapped areas.

This Kavett silty clay is suited to crops and adapted grasses. Capability unit IIIe-3; Shallow range site.

Kavett and Talpa soils, undulating (KAB).—This mapping unit consists of undulating soils on uplands. Mapped areas are as much as several thousand acres in size. Within most large mapped areas are a few smaller areas of soils other than the two dominant ones that give the units its name. Slopes are mostly 1 to 8 percent.

The composition of this mapping unit is more variable than most other mapping units in the county, but mapping was detailed enough to interpret for the expected uses of the soils. About 45 percent of this mapping unit is Kavett soils; 40 percent Talpa soils; 10 percent Kimbrough soils that are mainly on ridgetops; and 5 percent Purves soils.

The Kavett and Talpa soils are in alternate strips that are mostly 50 to 200 feet in width, or the two are intermingled in areas so small it is not practical to separate them on a map of the scale used for the publication.

The Kavett soils in this unit are cobbly or gravelly or are in spots too small for cultivation. The surface layer is about 6 inches of grayish-brown silty clay. Below this layer is brown silty clay about 8 inches thick. The next layer is caliche-cemented limestone fragments and is about 6 inches thick. The underlying material is hard limestone that extends to a depth of about 24 inches.

Talpa soils are shallower, more stony, and less clayey than Kavett soils. The Talpa soils in this unit have the profile described as representative for the Talpa series.

The soils of this mapping unit are as much as 30 percent stones and cobbles. Limestone fragments a foot or more in width are on the surface and in the surface layer.

This mapping unit is used only for grazing. The soils are well suited to native grasses. Both soils in capability unit VIe-3; Kavett part in Shallow range site; Talpa part in Very Shallow range site.

Kimbrough Series

The Kimbrough series consists of loamy soils that are very shallow over strongly cemented caliche. These undulating soils formed in thin remnants of old alluvium on uplands.

In a representative profile, the surface layer is dark-brown clay, about 6 inches thick, that contains a few caliche fragments. Below the surface layer is 6 inches of strongly cemented caliche. The upper 36 inches of the underlying material is white silt loam that is largely calcium carbonate. Below this, and extending to a depth of about 55 inches, is yellow loam.

These Kimbrough soils are well drained, and their permeability is moderate. They have a low available water capacity, and are subject to a moderate hazard of erosion.

Representative profile of Kimbrough clay loam, in an area of Kimbrough and Mereta soils, undulating, in range, 3.8 miles northeast of Leaday, Tex., on Ranch Road 2134, then 500 feet north of the road. This site is approximately 20 miles south and 36° west of the Coleman County Courthouse in Coleman:

A—0 to 6 inches, dark-brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, very fine, subangular blocky and granular structure; hard, friable; surface crust 0.5 inch thick; few worm casts; few small caliche fragments; calcareous; moderately alkaline; abrupt, wavy boundary.

C1cam—6 to 12 inches, white to very pale brown, strongly cemented caliche fragments, 1 to 3 inches thick and 6 to 12 inches wide; massive; extremely hard; about 3 percent soil like that in the above horizon between fragments and in old insect and worm channels; abrupt, wavy boundary.

C2ca—12 to 48 inches, white (10YR 8/2) silt loam, very pale brown (10YR 8/3) when moist; massive; hard, friable; few insect and worm channels filled with slightly darker soil; about 65 percent, by volume, segregated lime; diffuse, wavy boundary.

C3—48 to 55 inches, yellow (10YR 8/6) loam, yellow (10YR 7/6) when moist; massive; hard, friable; about 50 percent lime, by volume.

The A horizon ranges from 4 to 10 inches in thickness, from dark grayish brown to dark brown in color, and from granular to subangular blocky in structure. Caliche fragments and limestone or siliceous pebbles range from few to as much as 35 percent of this horizon.

The C1cam layer ranges from 2 to 10 inches in thickness. It is white to very pale brown, fractured, strongly cemented caliche. In the upper part of this layer, soil material between caliche plates makes up as much as 20 percent of the volume. Siliceous pebbles and limestone pebbles are embedded in this layer in some places.

These soils in Coleman County are outside the defined range for the Kimbrough series in that they have a clay loam A horizon.

Kimbrough and Mereta soils, undulating (KMB).—This mapping unit consists of undulating soils on uplands. The Kimbrough and Mereta soils that make up the major part of the mapping unit formed in old alluvial sediments. Mapped areas are irregular and 20 to almost 1,000 acres in size. Slopes are dominantly about 3 percent but range from 2 to 8 percent.

The composition of this mapping unit is more variable than most other mapping units in the county, but mapping was detailed enough to interpret for the expected uses of the soils. Most mapped areas have more Kimbrough than Mereta soils, but either soil may be dominant in a given area. The estimated composition of mapped areas is 30 to 75 percent Kimbrough soils and 25 to 70 percent Mereta soils.

These Kimbrough soils have the profile described as representative for the series.

A representative profile of the Mereta soils has a surface layer of brown clay loam that is about 16 inches thick. Below the surface layer is hardened caliche about 4 inches thick. The underlying material, extending to a depth of about 60 inches, is pink silty clay loam.

Included in this mapping unit are small intermixed areas of Portales soils and a few strips of rock outcrop where the mantle has been removed by erosion. Near the rock outcrops are narrow strips of Talpa and Kavett soils. Together these inclusions make up about 12 percent of the average mapped area.

Nearly all of this mapping unit is in range. The Kimbrough soils are not suited to cultivation, and the intermixed areas of Mereta clay loam are too small or isolated to be farmed. Some of the underlying caliche is used in roadbuilding, and many small caliche pits are located in this unit. Both soils in capability unit VIe-2; Kimbrough part in Very Shallow range site; Mereta part in Shallow range site.

Krum Series

The Krum series consists of gently sloping, calcareous, loamy soils at the base of steeper slopes. Slopes are plane to concave. When dry, these deep soils have cracks that are 0.5 to 1 inch wide and extend to depths of more than 20 inches.

In a representative profile, the surface layer is dark grayish-brown clay loam in the upper 7 inches and brown clay loam in the lower 29 inches. The next layer is yellowish-brown clay loam about 24 inches thick. The underlying material, extending to a depth of about 80 inches, is brownish-yellow clay loam (fig. 4).

Krum soils are well drained and have moderately slow permeability. They have a high available water capacity, and the hazard of erosion is moderate to high.

Representative profile of Krum clay loam, 1 to 3 percent slopes, in a cultivated field, 900 feet west and 100 feet north of the field entrance from U.S. Highway 283, which is 4.7 miles north of the intersection of U.S. Highway 283, U.S. Highway 84, and Texas Highway 206, and 2 miles from downtown Coleman. The site is approximately 6 miles north and 19° east of the Coleman County Courthouse in Coleman:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, fine and very fine, granular structure; hard, firm; weakly stratified surface crust about 0.25 inch thick; few small limestone and siliceous pebbles; few worm casts and worm channels; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—7 to 36 inches, brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; moderate, fine, blocky structure; very hard, firm; few small siliceous pebbles; few, fine and medium pores; calcareous; moderately alkaline; gradual, smooth boundary.

B—36 to 60 inches, yellowish-brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) when moist; moderate, medium, blocky structure; very hard, very firm; few limestone pebbles; few lime concretions; few iron-manganese pellets; few slickensides or grooved pressure faces about 2 inches in length; calcareous; moderately alkaline; gradual, smooth boundary.

Cca—60 to 80 inches, brownish-yellow (10YR 6/6) clay loam, yellowish brown (10YR 5/6) when moist; massive; very hard, firm; about 3 percent small lumps of lime, and a few small limestone pebbles; calcareous; moderately alkaline.

The A horizon ranges from dark grayish brown to brown. The B horizon, where present, ranges from yellowish brown to pale brown.

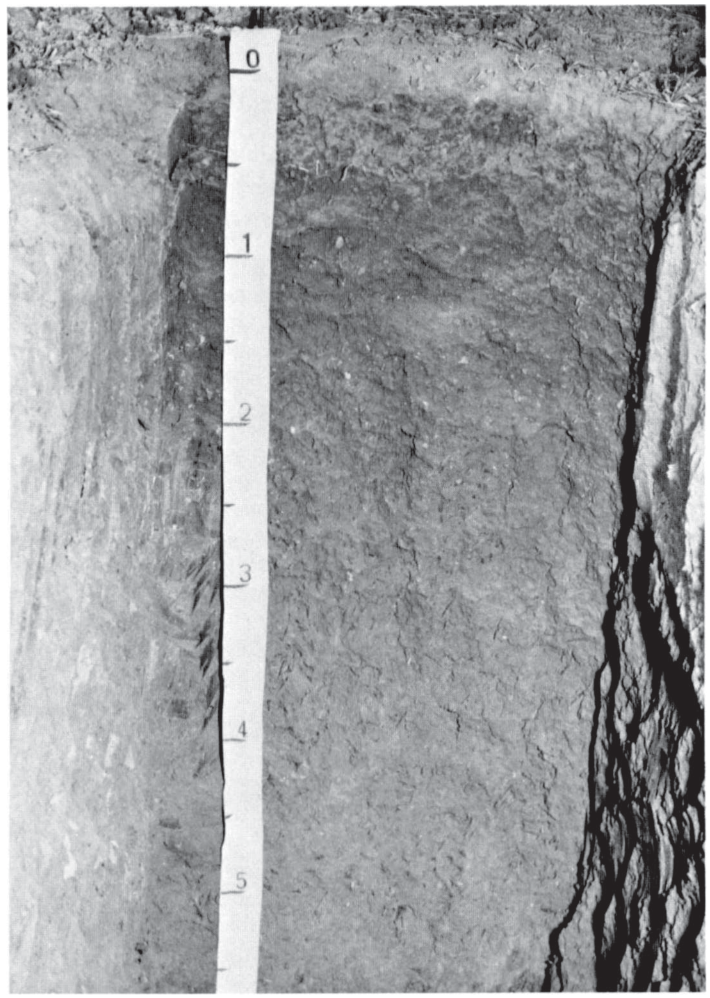

Figure 4.—Profile of Krum clay loam.

The Cca horizon is 36 to 72 inches from the surface. The clay content between depths of 10 and 40 inches is about 35 to 55 percent.

The amount of segregated calcium carbonate in the Cca horizon ranges from a few concretions and soft lumps to about 15 percent, by volume.

Krum clay loam, 1 to 3 percent slopes (KwB).—This soil is in elongated to fan-shaped areas 20 to 100 acres in size at the base of steeper slopes. Slopes are mostly 1.25 to 3 percent.

This soil has the profile described as representative for the Krum series.

Included with this soil in mapping are rounded areas dominantly 30 to 300 feet in width that are made up of gravelly or cobbly soils. These soils are on slight rises, appear to be formed from old alluvial fans, and make up less than 2 percent of the acreage. Some of the larger mapped areas contain slightly depressed or slightly benched areas, of Tobosa clay that are 2 to 4 acres in size. This Tobosa clay makes up as much as 10 percent of the acreage. In most areas of this Krum soil there are a few shallow gullies, crossable with farm machinery, and some areas having one or more deep gullies, usually along a fence line.

About half of this Krum clay loam is cultivated. Capability unit IIe–3; Deep Upland range site.

Krum clay loam, 3 to 5 percent slopes (KwC).—This soil is mostly in elongated or crescent-shaped areas 10 to 60 acres in size.

This soil has a surface layer of clay loam about 5 inches thick. Below the surface layer is blocky clay loam 36 inches thick. The next layer, extending to a depth of 60 inches, is clay loam.

The areas of this soil have a few more shallow gullies and gravelly spots than Krum clay loam, 1 to 3 percent slopes.

About a third of this Krum clay loam is cultivated. It is subject to a high hazard of erosion. Capability unit IIIe–4; Deep Upland range site.

Lindy Series

The Lindy series consists of moderately deep loamy soils on uplands. These noncalcareous soils are nearly level to gently sloping.

In a representative profile, the surface layer is brown clay loam, about 7 inches thick, that is very hard when dry. Below the surface layer is a layer of reddish-brown clay about 23 inches thick. The lower part of this layer contains limestone fragments. Below this is hard limestone (fig. 5).

These soils are well drained and slowly permeable. They have a moderate available water capacity.

Representative profile of Lindy clay loam, 1 to 3 percent slopes, in native range, 50 feet south of a ranch road and 0.4 mile east of the intersection of the ranch road and U.S. Highway 283. This intersection is 6.2 miles north of the junction of U.S. Highway 283, U.S. Highway 84, and Texas Highway 206, and it is approximately 7.8 miles north and 10° east of the Coleman County Courthouse in Coleman:

A1—0 to 7 inches, brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) when moist; weak, very fine, subangular blocky and granular structure; very hard, firm; common roots; few, small, rounded siliceous pebbles, and few angular chert pebbles; plentiful roots; few worm casts; mildly alkaline; clear, smooth boundary.

B2t—7 to 24 inches, reddish-brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) when moist; moderate, fine, blocky structure; very hard, very firm; clay films; few, small, rounded siliceous pebbles, and few angular chert pebbles; mildly alkaline; abrupt, irregular boundary.

B3—24 to 30 inches, reddish-brown (5YR 4/3) cobbly clay, dark reddish brown (5YR 3/3) when moist; moderate, fine, blocky structure; very hard, very firm; about 80 percent, by volume, limestone fragments, 1 to 10 inches in width; in the lower part of this horizon, spaces are filled with calcareous yellow to brown clay; abrupt, wavy boundary.

R—30 to 32 inches, hard, fractured limestone bedrock.

The A horizon ranges from reddish brown to dark yellowish brown in color and from 4 to 8 inches in thickness.

The B horizon ranges from reddish brown to brown in color and from 14 to 34 inches in thickness. Clay content of the B horizon ranges from 35 to about 50 percent.

Depth of this soil to limestone ranges from 20 to 40 inches. Soil reaction is mildly alkaline to moderately alkaline.

The soils named for this series are outside the defined range of the series in that the reaction of the Bt horizon is mildly to moderately alkaline, but this does not alter their usefulness or behavior.

Figure 5.—**Profile of Lindy clay loam.**

Lindy clay loam, 0 to 1 percent slopes (LdA).—This nearly level soil is in irregular areas 30 to 100 acres in size on uplands. Slopes range from 0.4 to 0.7 percent.

In a representative profile, the surface layer is brown clay loam about 8 inches thick. Below the surface layer is reddish-brown clay, about 24 inches thick, that has limestone fragments in the lower part. The underlying material is hard limestone that extends to a depth of about 36 inches.

Included with this soil in mapping are rounded, somewhat depressed areas of Tobosa clay that range from a few feet in width to about 3 acres in size. These make up less than 5 percent of a mapped area. Also included in some mapped areas are soils like Lindy clay loam, except they crack to a depth of 20 inches when dry.

Most of this Lindy clay loam is used for cultivated crops. The hazard of erosion is slight. Capability unit IIc–5; Deep Upland range site.

Lindy clay loam, 1 to 3 percent slopes (LdB).—This gently sloping soil is on uplands in irregular areas 10 to 200 acres in size. Slopes are plane to convex and dominantly about 1.5 percent.

The profile of this Lindy soil is the same as that described as representative for the series.

Included with this soil in some of the larger mapped areas are elongated strips of Speck clay loam that range to about 2 acres in size. Some of these areas are stony. Speck soils make up less than 2 percent of any mapped area. Another inclusion is slightly depressed areas of Tobosa clay that range to as much as 3 acres in size. Tobosa clay makes up less than 1 percent of the acreage. Also included in about 20 percent of the mapped acreage is a soil like Lindy clay loam except the limestone bedrock is more than 40 inches below the surface. Parts of some areas are made up of soils like Lindy clay loam, except that they crack to a depth of 20 inches when dry.

This Lindy clay loam is subject to a moderate hazard of erosion. Capability unit IIe–2; Deep Upland range site.

Menard Series

The Menard series consists of deep, loamy, gently sloping soils on uplands. These soils are in the upper part of broad valleys, below the foot slopes of the limestone hills.

In a representative profile, the surface layer is brown fine sandy loam about 6 inches thick. Below the surface layer is a layer of sandy clay loam, about 36 inches thick, that is red in the upper part and yellowish red in the lower part. The underlying material, extending to a depth of 72 inches, is reddish yellow. It is loam in the upper part and very fine sandy loam in the lower part.

These soils are well drained, and their permeability is moderate. The available water capacity is high.

Representative profile of Menard fine sandy loam, 1 to 5 percent slopes, eroded, in an old field, 150 feet east and 100 feet north of a small bridge on U.S. Highway 84, which is 2.1 miles southeast of Silver Valley. This site is 9.3 miles north and 38° west of the Coleman County Courthouse in Coleman:

Ap—0 to 6 inches, brown (7.5YR 5/3) fine sandy loam, dark brown (7.5YR 4/3) when moist; weak, fine and very fine, granular structure; hard, friable; few ironstone pebbles as much as 0.5 inch in diameter; mildly alkaline; abrupt, smooth boundary.

B2t—6 to 24 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) when moist; moderate, fine, blocky structure; very hard, firm; dark-red (2.5YR 3/6) clay films; few worm casts; few fine pores; mildly alkaline; gradual, wavy boundary.

B3—24 to 42 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) when moist; weak, medium, blocky structure; very hard, firm; few small lumps and concretions of lime; calcareous; moderately alkaline; gradual, wavy boundary.

C1ca—42 to 64 inches, reddish-yellow (7.5YR 8/6) loam, reddish yellow (7.5YR 7/6) when moist; massive; hard, friable; about 10 percent, by volume, lumps and concretions of lime as much as 1 inch in diameter; calcareous; moderately alkaline; diffuse, wavy boundary.

C2—64 to 72 inches, reddish-yellow (7.5YR 8/6) very fine sandy loam, reddish yellow (7.5YR 7/6) when moist; massive; hard, very friable; about 2 percent small lumps and concretions of lime; calcareous; moderately alkaline.

The A horizon ranges from 6 to 12 inches in thickness and from grayish brown to dark brown in color. The B horizon ranges from brown to yellowish red or red. The Cca horizon is about 30 to 50 inches below the surface.

Menard fine sandy loam, 1 to 3 percent slopes (MeB).—This soil is in irregular areas that average about 40 acres in size. Slopes are mostly convex and from 1.25 to 3 percent.

This Menard soil has a brown fine sandy loam surface layer about 10 inches thick. Below the surface layer is sandy clay loam about 36 inches thick. It is red in the upper part and yellowish red in the lower part. The next layer, extending to a depth of about 70 inches, is reddish-yellow loamy material.

Included with some mapped areas of this soil are small rounded spots of Weymouth loam. These inclusions are typically on a slight rise in the landscape and as much as 2 acres in size. They make up less than 5 percent of a mapped area.

About half of the acreage of this Menard fine sandy loam is cultivated. The hazard of erosion is moderate. Capability unit IIe–1; Sandy Loam range site.

Menard fine sandy loam, 1 to 5 percent slopes, eroded (MeC2).—This soil is in elongated and irregular areas that are from about 20 to as much as 500 acres in size. Slopes are mainly about 2 percent.

This soil has the profile described as representative for the Menard series. Soil areas contain many shallow gullies, rills, and thin spots. Most gullies are crossable with farm machinery. A few spots are severely eroded and have deep gullies.

In areas of this soil that have not been cultivated, the gullies are 2 feet deep or more and have steep sides. These gullies are 50 to 200 feet apart. The surface layer averages about 8 inches thick between the gullies. Larger areas have patches 4 to 5 acres in size that do not have gullies.

Mapped with this soil in some of the larger areas are patches of Weymouth loam on rounded or elongated ridges. These are as much as 3 acres in size and make up less than 2 percent of the acreage.

More than half the acreage of this Menard fine sandy loam is cultivated. Some old fields that were once cultivated now support weedy grasses and brush. These old fields respond well to seeding with grasses. Capability unit IIIe–5; Sandy Loam range site.

Menard-Weymouth complex, 1 to 5 percent slopes, eroded (MmC2).—Areas of this mapping unit are irregular and mainly 30 to 100 acres in size. A few areas range up to 400 acres in size. Slopes are dominantly about 2 percent.

This mapping unit consists mainly of Menard fine sandy loam and Weymouth loam. The Menard soil makes up about 60 percent of the unit, and the Weymouth soil 28 percent. Other soils, mainly Pedernales fine sandy loam, cover the remaining 12 percent. The soils of this mapping unit are too intermixed to be mapped separately at the scale used.

In a representative area, Menard fine sandy loam is on the more nearly level part of the landscape, Weymouth loam is on slight ridges, and Pedernales fine sandy loam is along the small natural drainageways.

The surface layer of the Menard soils is reddish-brown fine sandy loam about 6 inches thick. Below the surface layer is firm, yellowish-red sandy clay loam about 28 inches thick. The next layer, extending to a depth of about 60 inches, is reddish-yellow, loamy, calcareous material.

The surface layer of the Weymouth soil is brown, calcareous loam about 5 inches thick. Below the surface layer is reddish-brown loam about 18 inches thick. The underlying material, extending to a depth of 60 inches, is light-gray loam.

This mapping unit has shallow gullies, rills, and thin spots. Most gullies are crossable with farm machinery. In many places, the lower layer has been mixed with the surface layer by plowing. The surface layer averages less than 6 inches in thickness, but it is thicker than 6 inches between the gullies and on lower slopes.

Many old fields in this mapping unit are no longer cultivated. Both soils in capability unit IIIe-5; Menard part in Sandy Loam range site; Weymouth part in Shallow range site.

Mereta Series

The Mereta series consists of gently sloping, calcareous, loamy soils that are shallow over strongly cemented caliche.

In a representative profile, the surface layer is about 18 inches of brown clay loam. The next layer is strongly cemented caliche about 4 inches thick. Below this layer, and extending to a depth of about 60 inches, is pink silty clay loam.

These soils are well drained. Their permeability is slow, and the available water capacity is low.

Representative profile of Mereta clay loam, 1 to 3 percent slopes, in a cultivated field, 1,000 feet east and 400 feet south of a corner on a county road, which is 2 miles east of Shields, Tex., on Farm Road 1026, then 3 miles north on a county road, then 0.2 mile east of the junction of two county roads. This site is approximately 13.6 miles south and 12° east of the Coleman County Courthouse in Coleman:

Ap—0 to 5 inches, brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; weak granular structure; hard, friable; calcareous; moderately alkaline; abrupt, smooth boundary.

A11—5 to 10 inches, brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; moderate, very fine, subangular blocky and granular structure; slightly hard, friable; many fine roots; few worm casts; about 5 percent small lumps and concretions of calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

A12—10 to 18 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) when moist; moderate, very fine, subangular blocky and granular structure; slightly hard, friable; few fine roots; few worm casts; about 10 percent visible calcium carbonate in threads, small lumps, and caliche fragments; calcareous; moderately alkaline; abrupt, wavy boundary.

C1cam—18 to 22 inches, white, strongly cemented, fractured caliche; massive; abrupt, irregular boundary.

C2ca—22 to 60 inches, pink (7.5YR 7/4) silty clay loam, light brown (7.5YR 6/4) when moist; massive; slightly hard, friable; about 40 percent, by volume, small concretions and large soft lumps of calcium carbonate.

The A horizon ranges from dark grayish brown to brown in color and from 14 to 20 inches in thickness. The amount of caliche fragments and siliceous pebbles in this horizon ranges from none to about 10 percent of the volume. The C1cam horizon is about 2 to 6 inches thick. Rounded siliceous pebbles in the C horizon may account for as much as 10 percent of the volume.

Mereta clay loam, 1 to 3 percent slopes (MrB).—This gently sloping soil is in upland areas that are remnants of old alluvial plains. Soil areas are dominantly oval or elongated and average about 30 acres in size. Some areas are as large as 170 acres in size. Slopes are convex and dominantly about 1.5 percent. A few fragments of caliche are on the surface in most areas.

This soil has the profile described as representative for the Mereta series.

Included with this soil in mapping are areas of Kimbrough soils, some as large as 5 acres in size, in the larger mapped areas. They make up less than 10 percent of any one area. Another inclusion is Rowena clay loam intermixed with Portales clay loam in small, slightly depressed areas. These areas of Rowena and Portales soils make up less than 5 percent of the acreage.

This Mereta clay loam is suited to cultivation. About 50 percent is cultivated, and about 50 percent is in range. The hazard of erosion is moderate. Capability unit IIIe-3; Shallow range site.

Miles Series

The Miles series consists of deep, nearly level to gently sloping, loamy soils on uplands. In Coleman County, these soils are adjacent to flood plains.

In a representative profile, the surface layer is reddish-brown fine sandy loam about 6 inches thick. Below the surface layer is a layer of friable sandy clay loam about 78 inches thick. It is reddish brown in the upper part and red in the lower part. The underlying material, extending to a depth of about 96 inches, is light-red fine sandy loam.

These soils are well drained and moderately permeable. The available water capacity is high.

Representative profile of Miles fine sandy loam, 1 to 3 percent slopes, in a cultivated field, 0.4 mile north of a county road, from a point on the county road that is about 20 miles south of Santa Anna, Tex., on U.S. Highway 283, then west 0.7 mile on the county road to the point. This site is approximately 25 miles south and 8° east of the Coleman County Courthouse in Coleman:

Ap—0 to 6 inches, reddish-brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) when moist; weak, fine, granular structure; slightly hard, friable; few siliceous pebbles from 2 to 10 millimeters in diameter; weak surface crust 0.25 inch thick; mildly alkaline; abrupt, smooth boundary.

B21t—6 to 14 inches, reddish-brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) when moist; ped surfaces are one unit of chroma less than crushed color; moderate, coarse, prismatic and moderate, medium, subangular blocky structure; hard, friable; few fine roots; less than 2 percent pebbles; mildly alkaline; clear, smooth boundary.

B22t—14 to 48 inches, red (2.5YR 4/6) sandy clay loam, dark red (2.5YR 3/6) when moist; ped surfaces are one unit of chroma less than crushed color of peds; moderate, coarse, prismatic and moderate, medium subangular blocky structure; hard, friable; few fine roots; clay films; few pores; few worm casts; 1 percent siliceous pebbles; neutral; diffuse, wavy boundary.

B3ca—48 to 84 inches, red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) when moist; weak subangular blocky structure; hard, friable; about 4 percent segregated lime in threads, small soft lumps, and concretions as large as 12 millimeters in diameter; less than 2 percent small siliceous pebbles; calcareous; moderately alkaline; gradual, smooth boundary.

C—84 to 96 inches, light-red (2.5YR 6/6) fine sandy loam, red (2.5YR 5/6) when moist; massive; hard, friable; less than 2 percent concretions and soft lumps of lime; 5 percent siliceous pebbles that are 2 to 5 millimeters in diameter; few siliceous pebbles as much as 2 inches in diameter; calcareous; moderately alkaline.

The A horizon ranges from reddish brown to brown in color and from 6 to 14 inches in thickness. The B horizon ranges from reddish brown to red, reddish yellow, and yellowish red. The accumulation of lime in the lower part of the B and C horizons ranges from a few small lumps or concretions to a prominent zone of secondary carbonates.

The C horizon is 65 to 90 inches below the surface. Depth to an accumulation of secondary carbonates is 28 to 70 inches.

Miles fine sandy loam, 1 to 3 percent slopes (MsB).—This soil is in oval to elongated areas 20 to 250 acres in size.

Included with this soil in mapping are soils that have accumulations of lime less than 28 inches deep. These soils make up as much as 25 percent of some mapped areas. Also included are a few rounded spots, less than an acre in size, that are calcareous to the surface.

Nearly all of this Miles soil is cultivated. It is subject to a slight to moderate hazard of erosion. Capability unit IIe-1; Sandy Loam range site.

Nuvalde Series

The Nuvalde series consists of nearly level to gently sloping, calcareous, loamy soils on uplands. Slopes are plane to convex and about 0.5 to 2 percent.

In a representative profile, the surface layer is dark grayish-brown clay loam about 14 inches thick. The next layer is brown clay loam about 14 inches thick. The underlying material, extending to a depth of about 60 inches, is silty clay loam that contains a large accumulation of calcium carbonate in the upper part. This material is very pale brown in the upper part and light yellowish brown in the lower part.

The Nuvalde soils have a high available water capacity. They are well drained, and their permeability is moderate.

Representative profile of Nuvalde clay loam, 1 to 3 percent slopes, in a cultivated field, 150 feet south of a point on a county road that is 2 miles north of Mozelle, Tex., by Farm Road 1026, and 1.7 miles west on the county road. This site is approximately 14.7 miles south and 17° west of the Coleman County Courthouse in Coleman:

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, very fine, granular structure; hard, firm; few fine roots; less than 1 percent lime concretions that are 0.125 inch in diameter; few worm casts; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—5 to 14 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, very fine, subangular blocky structure; hard, firm; few fine roots; less than 1 percent lime concretions that are 0.125 inch in diameter; few worm casts; calcareous; moderately alkaline; gradual, smooth boundary.

B—14 to 28 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) when moist; moderate, very fine, subangular blocky structure; hard, firm; few fine roots; about 3 percent concretions of lime as much as 0.25 inch in diameter; few worm casts; calcareous; moderately alkaline; gradual, wavy boundary.

C1ca—28 to 50 inches, very pale brown (10YR 7/4) silty clay loam, light yellowish brown (10YR 6/4) when moist; massive; hard, firm; about 40 percent lime, by volume, in concretions as much as 0.25 inch in diameter, and soft lumps as large is 1 inch in diameter; diffuse, wavy boundary.

C2—50 to 60 inches, light yellowish-brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) when moist; massive; hard, firm; about 10 percent small lumps and concretions of lime.

The A horizon ranges from brown to dark brown in color and from about 10 to 20 inches in thickness.

The B horizon ranges from 13 to 30 inches in thickness and from 35 to 45 percent clay.

The Cca horizon is 23 to 40 inches below the surface.

In the upper part of the C horizon, concretions and lumps of lime make up from 40 to 70 percent of the volume, and they decrease by at least 5 percent with increasing depth.

Nuvalde clay loam, 0 to 1 percent slopes (NuA).—This nearly level soil is on the remnants of old alluvial plains. Soil areas are irregular and 40 to 200 acres in size.

The surface layer is grayish-brown clay loam about 12 inches thick. Below the surface layer is light-brown, firm clay loam about 20 inches thick. The next layer, extending to a depth of about 80 inches, is pink clay loam that has large accumulations of calcium carbonate in the upper part.

Mapped with this soil are small areas of Mereta clay loam that make up as much as 10 percent of the acreage. These scattered patches are near the edges or on slight rises within the mapped area. Small patches of Rowena clay loam make up as much as 10 to 15 percent of some mapped areas. These are along small drainageways or in slightly depressed areas.

Nearly all of this Nuvalde clay loam is cultivated. Capability unit IIc-4; Deep Upland range site.

Nuvalde clay loam, 1 to 3 percent slopes (NuB).—This gently sloping soil is on uplands in irregular areas that range to 200 acres in size.

This soil has the profile described as representative for the Nuvalde series.

Mapped with this soil are patches of Mereta clay loam. They are on slight rises and range from less than an acre to about 3 acres in size. Also included are slightly depressed patches of Rowena clay loam. These inclusions make up about 10 percent of the acreage but are not in every mapped area.

More than half of this Nuvalde clay loam is cultivated. Capability unit IIe-3; Deep Upland range site.

Olton Series

The Olton series consists of nearly level to gently sloping soils on upland plains or on bench terraces along streams.

In a representative profile, the surface layer is brown clay loam about 6 inches thick. The next layer is very firm clay about 40 inches thick. It is dark reddish brown in the upper part and reddish brown in the lower part.

Below this, and extending to a depth of 108 inches, is pink clay loam (fig. 6).

The Olton soils are moderately slowly permeable and have a high available water capacity. They are well drained.

Representative profile of Olton clay loam, 0 to 1 percent slopes, in a cultivated field, 150 feet south of a point on a county road that is 0.75 mile east of the road's intersection with the Santa Fe Railway in Coleman. This site is 0.8 mile east and 7° north of the Coleman County Courthouse in Coleman:

Ap—0 to 6 inches, brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) when moist; weak, fine, granular structure; hard, firm; few siliceous pebbles as much as 0.25 inch in diameter; mildly alkaline; abrupt, smooth boundary.

B21t—6 to 16 inches, dark reddish-brown (5YR 4/2) clay, dark reddish brown (5YR 3/2) when moist; moderate, fine, blocky structure; very hard, very firm; few siliceous pebbles; nearly continuous clay films; mildly alkaline; gradual, smooth boundary.

B22t—16 to 46 inches, reddish-brown (5YR 5/4) clay, reddish brown (5YR 4/4) when moist; moderate, fine and medium, blocky structure; very hard, very firm; less than 1 percent is small calcium carbonate concretions; few siliceous pebbles; few films, threads, and spots of lime; nearly continuous clay films on ped surfaces; calcareous; moderately alkaline; gradual, wavy boundary.

B3ca—46 to 66 inches, pink (5YR 7/5) clay loam, light reddish brown (5YR 6/5) when moist; weak, medium, subangular blocky structure; hard, friable; 50 percent pockets of soft lime; 2 percent calcium carbonate concretions in upper part; calcareous; moderately alkaline; gradual, smooth boundary.

C—66 to 108 inches, pink (5YR 7/4) clay loam, light reddish brown (5YR 6/4) when moist; massive; hard, friable; about 2 percent pockets of soft lime; few hard lumps of lime; calcareous; moderately alkaline.

The A horizon ranges from dark reddish brown to dark brown in color and from 6 to 12 inches in thickness. The B horizon ranges from dark reddish brown to strong brown in color in the upper part and pink to light brown in the lower part. The B horizon is 17 to 46 inches thick to a prominent layer of calcium carbonate in the lower part of the horizon. Texture of the B horizon is clay loam to clay, and structure is moderate, coarse, blocky to moderate, very fine, blocky and subangular blocky.

The C horizon begins at a depth of 60 to 72 inches. It is made up of calcareous loamy alluvial sediments that contain varying amounts of segregated lime.

Depth to a prominent layer of calcium carbonate accumulation is 22 to 50 inches. Segregated lime is within 24 inches of the surface.

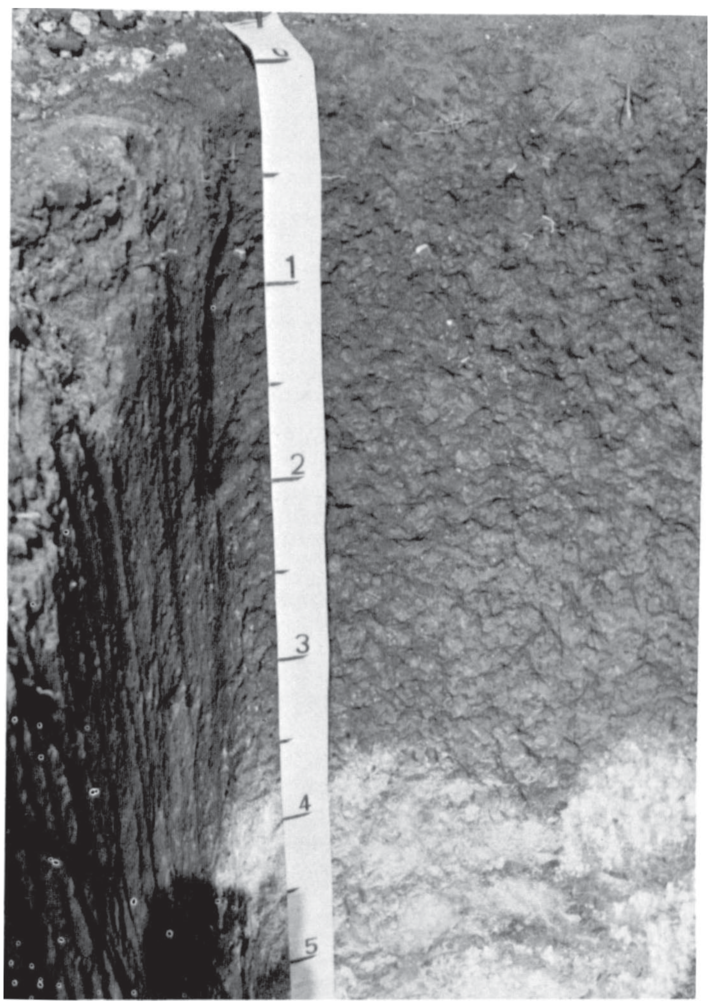

Figure 6.—**Profile of Olton clay loam.**

Olton clay loam, 0 to 1 percent slopes (OcA).—This nearly level soil is on upland plains or bench terraces along streams. Soil areas are irregular and 10 to 300 acres in size.

This soil has the profile described as representative for the Olton series.

Mapped with this soil are slightly depressed, rounded spots of Rowena clay loam and a few patches of Winters fine sandy loam. These range to as much as 5 acres in size in some of the larger mapped areas, but they make up less than 10 percent of any mapped area.

This Olton clay loam is well suited to cultivation. The hazard of erosion is slight. Capability unit IIc-3; Deep Upland range site.

Olton clay loam, 1 to 3 percent slopes (OcB).—This gently sloping soil is on upland plains or stream terraces. The soil areas are 20 to 120 acres in size and are irregular to oval, or are elongated where they parallel streams. Slopes are convex to plane and dominantly 1.25 to 2 percent.

The surface layer is dark-brown clay loam about 8 inches thick. The next layer, about 50 inches thick, is clay that is dark brown in the upper part and brown in the lower part. The next layer, extending to a depth of about 80 inches, is pink clay loam that has accumulations of calcium carbonate mostly in the upper part.

Mapped with this soil are slightly depressed, rounded areas as much as 2 acres in size of dark-gray clay soils. Another inclusion is Rowena clay loam in areas of similar size. Together these inclusions make up as much as 10 percent of some mapped areas. Also included are minor areas of gravelly, calcareous soils that are mainly near the edge of a mapped area. These make up about 2 percent of some mapped areas.

More than half of this Olton clay loam is cultivated; the rest is in range. This soil is subject to a moderate hazard of erosion. Capability unit IIe-2; Deep Upland range site.

Owens Series

The Owens series consists of calcareous clayey soils that are shallow over shaly clay. These gently sloping to moderately steep soils are on uplands below scarps.

In a representative profile, the surface layer is grayish-brown calcareous clay about 7 inches thick. The next layer, about 11 inches thick, is very firm pale-brown clay. The underlying material, extending to a depth of about 36 inches, is brown and olive-gray shaly clay.

These soils are well drained and very slowly permeable. They have a low available water capacity. Runoff is rapid, and the hazard of erosion is high.

Representative profile of an Owens soil, in an area of Stony land and Owens soils, moderately steep, in range.

A1—0 to 7 inches, grayish-brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) when moist; moderate, very fine, subangular blocky and blocky structure; very hard, very firm; limestone fragments, mostly of pebble and cobble size, cover about 6 percent of the surface; calcareous; moderately alkaline; clear, smooth boundary.

B—7 to 18 inches, pale-brown (10YR 6/3) clay, brown (10YR 4/3) when moist; moderate, very fine, blocky and subangular blocky structure; very hard, very firm; few small calcium carbonate concretions; few, slightly weathered, shaly clay lumps or fragments in the lower 4 inches; calcareous; moderately alkaline; gradual, smooth boundary.

C—18 to 36 inches, brown and olive-gray shaly clay that contains a few red streaks; massive; very hard, very firm; few soft lumps of lime and few lime concretions that together make up less than 2 percent of the volume; calcareous; moderately alkaline.

The A horizon ranges from dark grayish brown to weak red in color and from 4 to 10 inches in thickness. The B horizon ranges from olive to reddish brown in color and from 4 to 14 inches in thickness. The underlying strata are shaly clay to sandy shale.

Depth of the soil over shaly clay ranges from 12 to 20 inches, and clay content is 35 to 55 percent. Rock fragments on the surface and in the profile of the soil range from few to about 35 percent.

Owens clay, 1 to 3 percent slopes (OwB).—This gently sloping soil is on uplands. Soil areas are rounded to elongated and are on slight ridges or slope breaks above drainageways. Slopes are dominantly about 2 percent. A few pebbles or cobbles of sandstone or limestone are on the surface in places.

The surface layer is light olive-brown clay about 6 inches thick. The next layer is olive-brown clay about 10 inches thick. The underlying material, extending to a depth of 30 inches, is shaly clay.

Included with this soil in mapping are soils similar to Owens, but they are deeper than 20 inches. These soils, which make up as much as 10 percent of some areas, are mainly along local drainageways that cross or extend into a mapped area. Other inclusions are small areas where thin layers of sandstone or limestone either outcrop or lie near the surface. These spots make up 2 to 3 percent of some mapped areas.

This Owens clay is best suited to grasses. Capability unit IVe–1; Shallow range site.

Pedernales Series

The Pedernales series consists of loamy and sandy soils in shallow valleys and on side slopes.

In a representative profile, the surface layer is light-brown fine sandy loam about 8 inches thick. The next layer is yellowish-red clay in the upper 20 inches, yellowish-red clay in the next 10 inches, and light reddish-brown clay loam in the lower 8 inches. The underlying material, extending to a depth of about 54 inches, is pinkish-white to reddish-yellow loam.

These soils are slowly permeable. They are well drained, and the available water capacity is high.

Representative profile of Pedernales fine sandy loam, 1 to 3 percent slopes, in range, 60 feet west of a field fence and 100 feet south of a point on Farm Road 702, which is 0.4 miles east of the intersection of Farm Roads 1770 and 702 in Novice, Tex. This site is approximately 15.8 miles north and 49° west of the Coleman County Courthouse in Coleman:

A1—0 to 8 inches, light-brown (7.5YR 6/3) fine sandy loam, brown (7.5YR 4/3) when moist; weak, very fine, granular structure; hard, very friable; common roots; few fine pores; mildly alkaline; abrupt, smooth boundary.

B21t—8 to 28 inches, yellowish-red, (5YR 5/6) clay, yellowish red (5YR 4/6) when moist; weak, medium, blocky structure in the upper 3 inches and moderate, medium, blocky structure below; very hard, very firm; few medium and small pores from root and insect or worm activity; continuous clay films below the upper 3 inches; medium acid; gradual, smooth boundary.

B22t—28 to 38 inches, yellowish-red (5YR 5/6) clay loam, yellowish red (5YR 4/6) when moist; common, medium, distinct mottles of reddish yellow; weak to moderate, coarse, blocky structure; very hard, very firm; ped surfaces 1 unit darker than the interior; nearly continuous clay films; slightly acid; gradual, smooth boundary.

B3ca—38 to 46 inches, light reddish-brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) when moist; common, medium, distinct mottles of reddish yellow; weak, coarse, blocky structure; hard, firm; about 2 percent segregated lime in small soft lumps and concretions; few small fragments of brittle, slightly weathered loamy fine earth; calcareous; moderately alkaline; gradual, wavy boundary.

Cca—46 to 54 inches, pinkish-white to reddish-yellow intermixed loams; massive; very hard, very firm; about 3 percent calcium carbonate in whitish soft lumps and in a few concretions.

The A horizon ranges from pale brown to reddish brown in color and from fine sandy loam to loamy fine sand in texture. The fine sandy loam A horizon ranges from 6 to 10 inches in thickness, and the loamy fine sand A horizon ranges from 6 to 20 inches in thickness.

The B horizon ranges from reddish brown to red or reddish yellow in color and from 26 to 44 inches in thickness. This horizon is sandy clay, clay loam, or clay and is 35 to 50 percent clay. The solum is 35 to 50 inches thick.

Pedernales loamy fine sand, 1 to 3 percent slopes (PdB).—This soil is in irregular areas 10 to 500 acres in size. Slopes are dominantly about 1.5 percent.

The surface layer is light-brown loamy fine sand about 12 inches thick. The next layer is red sandy clay about 38 inches thick. The underlying material, extending to a depth of about 60 inches, is calcareous, pinkish-gray sandy clay loam.

Wind and water erosion have thinned the surface layer in some spots, and some areas contain a few shallow gullies.

This Pedernales loamy fine sand is suited to cultivated crops grown in the county. It is subject to moderate haz-

ards of soil blowing and water erosion. Capability unit IIIe-1; Tight Sandy Loam range site.

Pedernales fine sandy loam, 1 to 3 percent slopes (PeB).—This soil is in irregular areas 10 to 60 acres in size. Slopes are dominantly about 1.5 percent.

This soil has the profile described as representative for the Pedernales series.

Mapped with this soil are elongated areas of Abilene clay loam along shallow drainageways. These are dominantly less than 4 acres in size and make up less than 10 percent of any mapped area. Also included are oval areas of Weymouth soils less than 2 acres in size. These are on slight rises or ridges and make up less than 5 percent of a mapped area.

This Pedernales fine sandy loam is suited to cultivation. The erosion hazard is moderate. Capability unit IIIe-6; Tight Sandy Loam range site.

Pedernales fine sandy loam, 1 to 3 percent slopes, eroded (PeB2).—This soil is in irregular areas 15 to 60 acres in size. Slopes are dominantly about 2 percent, but a few areas have slopes ranging to as much as 5 percent.

The surface layer is reddish-brown fine sandy loam about 6 inches thick. The next layer is red sandy clay about 30 inches thick. The underlying material is light-gray sandy clay loam.

Mapped with this soil are spots that have a clay loam surface layer because of erosion. They make up about 15 percent of many mapped areas. Some severely eroded, deeply gullied spots as much as 3 acres in size make up less than 10 percent of any mapped area and less than 1 percent of the total acreage. Also included are oval areas of Weymouth loam on low ridges. The ridges are less than 2 acres in size and make up less than 5 percent of a mapped area. Another inclusion is elongated spots of Abilene clay loam along shallow drainageways. They are less than 4 acres in size and make up less than 10 percent of the acreage.

This Pedernales fine sandy loam is suited to cultivation. When cultivated, the surface of the soil tends to crust after a rain. This soil is also suited to grasses. Capability unit IIIe-5; Tight Sandy Loam range site.

Portales Series

The Portales series consists of loamy, gently sloping, calcareous soils on uplands.

In a representative profile, the surface layer is brown loam about 10 inches thick. Below the surface layer is a layer of light yellowish-brown, friable clay loam about 13 inches thick. The underlying material, extending to a depth of about 60 inches, is loam. It is pinkish white in the upper part and pink in the lower part.

These soils are well drained and moderately permeable. They have a moderate available water capacity.

In Coleman County, the Portales soils are mapped only in a complex with the Weymouth soils.

Representative profile of Portales loam, in an area of the Weymouth-Portales complex, 1 to 3 percent slopes, in native range, 150 feet west of a point on a county road that is 4.5 miles west of Valera, Tex., by U.S. Highway 67, and 0.5 mile north on the county road. This site is approximately 16.8 miles west and 20° south of the Coleman County Courthouse in Coleman:

A—0 to 10 inches, brown (10YR 4/3) loam, dark brown (10YR 3/3) when moist; moderate, very fine, subangular blocky and granular structure; slightly hard, friable; calcareous; moderately alkaline; gradual, smooth boundary.

B2—10 to 23 inches, light yellowish-brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) when moist; moderate, very fine, subangular blocky and granular structure; hard, friable; films and threads of lime; few fine calcium carbonate concretions; calcareous; moderately alkaline; clear, wavy boundary.

C1ca—23 to 42 inches, pinkish-white (7.5YR 8/2) loam, pink (7.5YR 8/4) when moist; weak, fine, subangular blocky structure; hard, friable; marly fine earth that is about 10 percent, by volume, streaks and pockets of brown krotovinas, mainly in old root channels; calcareous; moderately alkaline; gradual, wavy boundary.

C2ca—42 to 60 inches, pink loam; massive; hard, friable; marly fine earth that contains pockets of white lime; few calcium carbonate concretions; fragments of weakly cemented sandstone in the lower part, amount increasing with depth; calcareous; moderately alkaline.

The A horizon ranges from dark grayish brown to brown in color and from 10 to 20 inches in thickness.

The B horizon ranges from brown to brownish yellow in color and from 12 to 25 inches in thickness.

The Cca horizon is 22 to 40 inches below the surface. It contains few to many concretions and pockets of lime, and the percentage of weakly cemented sandstone and marly clay increases with depth.

Purves Series

The Purves series consists of shallow, calcareous, loamy and clayey soils that overlie hard limestone. These soils are gently sloping to sloping and undulating and are on uplands.

In a representative profile, the surface layer is dark grayish-brown clay loam in the upper 9 inches and brown clay in the lower 9 inches. Below this is hard limestone that has a thin caliche coating.

These Purves soils are well drained, and their permeability is moderately slow. They have a low available water capacity.

Representative profile of Purves clay loam, in an area of Tarrant and Purves soils, undulating, in range, 500 feet south of a point on U.S. Highway 67. This point is 1 mile west of the junction of U.S. Highway 67 and Farm Road 503 in Valera, Tex. The site is 9.6 miles south and 34° west of the Coleman County Courthouse in Coleman:

A11—0 to 9 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine and very fine, subangular blocky structure; hard, firm; numerous fine roots; about 11 percent limestone pebbles as much as 2 inches in diameter; calcareous; moderately alkaline; gradual, smooth boundary.

A12—9 to 18 inches, brown (10YR 5/3) clay, dark brown (10YR 4/3) when moist; moderate, very fine, subangular blocky and granular structure; numerous fine roots; 3 percent calcium carbonate concretions as much as 0.25 inch in diameter; about 10 percent limestone pebbles, increasing to 15 percent with depth; calcareous; moderately alkaline; abrupt, smooth boundary.

R—18 to 22 inches, hard limestone that has a thin caliche coating.

Thickness of the soil over limestone ranges from 10 to 20 inches. Color ranges from very dark grayish brown to brown.

Purves and Owens soils, undulating (POB).—This mapping unit is made up of an estimated 30 percent Purves soils and 25 percent Owens soils; but in individual delineations the range is from 15 to 50 percent Purves and from 20 to 55 percent Owens. Krum soils make up about 12 percent of the unit, Bonti soils 10 to 15 percent, Tarrant soils 10 percent, and Valera soils 8 percent. This mapping unit is more variable than most other mapping units in the county, but mapping was detailed enough to interpret the soils for the expected uses.

This mapping unit is in an undulating landscape where slopes range mostly from 2 to 8 percent. Mapped areas are irregular and dominantly 40 to 200 acres in size, although some are as large as 600 acres in size.

The great variation in the nature and arrangement of the underlying rock contributes to the varied soil patterns in this unit. Beds of limestone and shaly clay are closely associated with strata that contain a large amount of sandstone. This close association gives rise to intermixed areas of deep to very shallow soils in which there are occasional rock outcrops, stony areas, and a few short, steep slopes.

The Purves soils have a surface layer of brown clay loam about 15 inches thick. The underlying material, extending to a depth of about 22 inches, is caliche-coated limestone.

The areas of Purves soils are mainly elongated and in slightly benched positions on side slopes or just above low scarps. They are intermixed with Tarrant soils. The intermixed areas of Tarrant and Purves soils range from less than an acre to about 12 acres in size.

Owens soils have a surface layer of grayish-brown clay about 6 inches thick. The next layer is firm clay about 8 inches thick. The underlying material, extending to a depth of about 30 inches, is shaly clay.

The Owens soils are mainly in elongated strips from 1 to 30 acres in size. These strips are on the lower part of the more sloping areas.

Areas of Krum clay loam are in valleys and on foot slopes below the Owens soils. These areas are dominantly rounded or crescent shaped and from 2 to 10 acres in size. A few areas are as large as 20 acres in size and are in narrow strips below low scarps.

The Bonti soils are mainly on ridgetops and side slopes in areas 1 to 40 acres in size.

Elongated strips of Valera clay are on side slopes or adjacent to drainageways and range from 1 to 10 acres in size.

Some mapped areas include gravelly remnants of old high terraces that are less than 20 inches thick and overlie beds of waterworn siliceous and limestone gravel.

In most places, the soils of this mapping unit have 3 percent or more of their surface covered with stones and cobbles. The mapping unit is used for range. Both soils in capability unit VIe–3; Purves part in Shallow range site; Owens part in Shaly Hills range site.

Rowena Series

The Rowena series consists of nearly level to gently sloping, calcareous, loamy soils on uplands.

In a representative profile, the surface layer is dark grayish-brown clay loam about 6 inches thick. The next layer is dark grayish-brown clay in the upper 10 inches and dark-brown clay in the lower 14 inches. The underlying material is pink clay loam to a depth of 50 inches and light brown clay to a depth of 94 inches.

These Rowena soils are well drained and have a high available water capacity. They have moderately slow permeability.

Representative profile of Rowena clay loam, 0 to 1 percent slopes, in a cultivated field, 100 feet west of a point on U.S. Highway 283, which is 1.2 miles north of Rockwood, Tex. This site is approximately 22.2 miles south and 70° east of the Coleman County Courthouse in Coleman:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; hard, friable; calcareous; moderately alkaline; abrupt, smooth boundary.

B21—6 to 16 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky and blocky structure; ped surfaces are shiny; hard, firm; few fine roots; few worm casts; few calcium carbonate concretions, 1 to 3 millimeters in diameter; calcareous; moderately alkaline; gradual, wavy boundary.

B22—16 to 30 inches, dark-brown (10YR 4/3) clay, dark brown (10YR 3/3) when moist; moderate, fine, subangular blocky and blocky structure; ped surfaces are shiny; hard, firm; few fine roots; few worm casts; about 5 percent calcium carbonate concretions as much as 5 millimeters in diameter; calcareous; moderately alkaline; gradual, wavy boundary.

C1ca—30 to 50 inches, pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) when moist; weak, medium, blocky structure; slightly hard, friable; few worm casts; about 15 percent large soft lumps of lime, and few small lime concretions; calcareous; moderately alkaline; diffuse, wavy boundary.

C2—50 to 94 inches, light-brown (7.5YR 6/4) clay, brown (7.5YR 5/4) when moist; massive; hard, firm; about 20 percent pockets of white lime in the upper part, and about 10 percent in the lower part.

The A horizon ranges from very dark grayish brown to brown in color and from 5 to 12 inches in thickness.

The B horizon ranges from very dark grayish brown to reddish brown in color and from 14 to 34 inches in thickness.

The C1ca horizon is 26 to 40 inches below the surface. It is reddish yellow to pale brown. Lumps and concretions of calcium carbonate make up 15 to 60 percent of the volume of this layer.

Rowena clay loam, 0 to 1 percent slopes (RwA).—This nearly level soil is on uplands in areas that are mostly 50 to 200 acres in size. Slopes are dominantly between 0.5 and 1 percent.

This soil has the profile described as representative for the series.

Mapped with this soil are intermixed spots of Tobosa clay and Abilene clay loam that range from a few feet across to as much as 3 acres in size. Some mapped areas have similar intermixed spots of Olton clay loam. These inclusions make up as much as 15 percent of a mapped area.

This Rowena clay loam is suited to crops, and most of it is cultivated. Surface runoff is slow, and the hazard of erosion is slight. Capability unit IIs–1; Deep Upland range site.

Rowena clay loam, 1 to 3 percent slopes (RwB).—This gently sloping soil is on uplands in areas that are mostly 25 to 150 acres in size. Slopes are dominantly about 1.5 percent.

The surface layer is brown clay loam about 6 inches thick. The next layer is brown clay about 24 inches thick. The underlying material, extending to a depth of about 64 inches, is pink clay loam.

Also mapped with this soil are small areas of Tobosa clay as much as 3 acres in size and mainly at the heads of small drainageways or in slightly depressed areas. Olton clay loam also is in some mapped areas in spots too small to be mapped separately. These inclusions make up about 12 percent of a typical mapped area.

Most of this Rowena clay loam is cultivated. Runoff is slow, and the hazard of erosion is moderate. Capability unit IIe-3; Deep Upland range site.

Sarita Series

The Sarita series consists of deep, sandy, gently sloping and gently undulating soils on uplands.

In a representative profile, the surface layer is loose loamy fine sand, about 48 inches thick, that is grayish brown in the upper 7 inches and light brown below. The next layer, extending to a depth of 72 inches, is yellowish-red sandy clay loam.

These soils are moderately permeable, and runoff is slow. The available water capacity is low.

Representative profile of Sarita loamy fine sand, 1 to 5 percent slopes, in pasture, 150 feet north of a fence line, 1,650 feet east of a ranch trail, and 0.9 mile south of the ranch headquarters. The ranch headquarters is 0.8 mile west of Gouldbusk, Tex., by Farm Road 1026, then south 6 miles and west 1 mile on a county road. This site is approximately 28 miles south and 9° west of the Coleman County Courthouse in Coleman:

A1—0 to 7 inches, grayish-brown (10YR 5/2) loamy fine sand, dark brown (10YR 4/3) when moist; massive; loose; few small siliceous pebbles; mildly alkaline; clear, smooth boundary.

A2—7 to 48 inches, light-brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) when moist; massive; loose; few small siliceous pebbles; mildly alkaline; clear, smooth boundary.

B2t—48 to 72 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) when moist; weak, medium, subangular blocky structure; very hard, friable; few fine roots; patchy clay films of slightly darker color than broken ped surfaces; few small siliceous pebbles; neutral.

The A horizon ranges from grayish brown to very pale brown in color and from 40 to about 60 inches in thickness. The B horizon ranges from red to yellowish red in color. The solum ranges from about 60 to more than 80 inches in thickness.

The soils named for this series are outside the defined range of the series in that they are a few degrees cooler, the color of the B horizon is redder, and they lack gray mottles in the B horizon. These differences do not alter their usefulness or behavior.

Sarita loamy fine sand, 1 to 5 percent slopes (SaC).—This soil is in irregular areas dominantly more than 100 acres in size. The soil has complex slopes that range from about 2 to 5 percent.

Included with this soil in mapping are soils like the Sarita, except they are thicker than 60 inches over the reddish underlying material. These areas make up about 15 percent of the typical mapped acreage. In a few places, the soil mantle is thin, and it is abruptly underlain by unrelated limestone or shaly clay.

Much of this Sarita loamy fine sand was once cultivated, but now most is in range. This soil is best suited to grass because it is subject to high hazard of soil blowing. Capability unit IVe-2; Deep Sand range site.

Somervell Series

The Somervell series consists of moderately steep, moderately deep soils on hillsides. These soils are loamy, stony, and cobbly.

In a representative profile, the surface layer, about 8 inches thick, is dark-brown cobbly loam. It is about 50 percent limestone fragments that range from small pebbles to about 10 inches in width. Below the surface layer is a layer of yellowish-brown cobbly loam, about 14 inches thick, that is about 75 percent limestone fragments, mostly 4 inches to about 1 foot in width. Below this is very pale brown limestone.

These Somervell soils are well drained and moderately permeable. The available water capacity is low.

Representative profile of Somervell cobbly loam, in an area of Somervell-Stony land complex, moderately steep, in range, 100 feet south of a point on a county road that is about 7 miles west of Coleman, Tex., by Farm Road 53, then 2.7 miles south by Farm Road 503, and 2.85 miles west on the county road. This site is approximately 9.5 miles south and 84° west of the Coleman County Courthouse in Coleman:

A1—0 to 8 inches, dark-brown (10YR 4/3) cobbly loam, dark brown (10YR 3/3) when moist; moderate, very fine, subangular blocky structure; slightly hard, friable; common roots; about 50 percent, by volume, cobble- and gravel-sized limestone fragments; cobble- and stone-sized fragments cover about 5 percent of the surface; calcareous; moderately alkaline; clear, smooth boundary.

B2—8 to 22 inches, yellowish-brown (10YR 5/4) cobbly loam, dark yellowish brown (10YR 4/4) when moist; moderate, very fine, subangular blocky structure; slightly hard, friable; common roots; about 75 percent, by volume, limestone fragments, mostly 4 inches to about 1 foot in diameter; calcareous; moderately alkaline; gradual, smooth boundary.

R—22 to 26 inches, very pale brown limestone; can be dug with a spade and broken in the hands; hardness less than 3 on Mohs' scale.

The A horizon ranges from very dark grayish brown to grayish brown in color and from 7 to 20 inches in thickness.

The B horizon is light gray, light brownish gray, pale brown, brown, yellowish brown, or grayish brown.

The soil is 20 to 40 inches thick over marly limestone. Gravel- and cobble-size limestone fragments make up 35 to about 85 percent of the soil volume.

Somervell-Stony land complex, moderately steep (SoE).—The soils of this mapping unit are at the edge of large areas of Tarrant soils. Slopes are dominantly about 12 percent but range from about 8 to 30 percent. Mapped areas range from about 15 to 300 acres in size.

This mapping unit is made up of an estimated 45 percent Somervell soils, 35 percent soils similar to Somervell but less than 20 inches deep to marly limestone, and 20 percent Stony land.

The areas of this mapping unit are long and average about 400 feet in width. The Somervell soils are mainly below and adjacent to the Stony land on the slope. Intermixed with the Somervell soils and on the lower slopes are the soils that are not so deep as the Somervell.

Also mapped in this unit are narrow strips of Tarrant soils on slight benches above outcropping limestone on hillsides.

The soils of this mapping unit are suited to range or wildlife use. The hazard of erosion is high. Both soils in capability unit VIIs-1; Somervell part in Steep Adobe range site; Stony land part in Rocky Hills range site.

Speck Series

This series consists of shallow, loamy and clayey soils that overlie limestone. These soils are gently sloping to sloping and are on uplands.

In a representative profile, the surface layer is dark-brown clay loam about 8 inches thick. The next layer, about 10 inches thick, is reddish-brown clay. Below this is hard limestone.

These Speck soils are slowly permeable, and the hazard of erosion is moderate. They are well drained, and the available water capacity is low.

Representative profile of Speck clay loam, 1 to 3 percent slopes, in range, 6 miles south of Santa Anna, Tex., by U.S. Highway 283, then east 1.5 miles on Farm Road 2633 to a junction with a county road; then north 1 mile on the county road to a farm trail, and 1.5 miles east on the farm trail to a fork in the trail; then 600 feet north from the fork and 225 feet east of the trail to the site. This site is 14 miles south and 37° east of the Coleman County Courthouse in Coleman:

A1—0 to 8 inches, dark-brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) when moist; moderate, fine and medium, granular and subangular blocky structure; hard, firm; few small siliceous pebbles; neutral; clear, smooth boundary.

Bt—8 to 18 inches, reddish-brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) when moist; moderate to strong, medium, blocky structure; very hard, very firm; patchy clay films on ped faces; few, small, calcium carbonate concretions in lower 2 inches; mildly alkaline; abrupt, wavy boundary.

R—18 to 22 inches, hard limestone that has a thin caliche coating; hard limestone fragments a foot or more in diameter along the long axis, averaging 2.25 inches in thickness, and coated with hard caliche; limestone is less fractured in the lower part; contains some impure limestone; hard limestone pebbles and reddish clay in vertical and horizontal crevices.

The A horizon ranges from dark grayish brown to reddish brown in color and from 7 to 9 inches in thickness.

The B horizon ranges from reddish brown to brown in color and from 7 to 12 inches in thickness.

Limestone is 14 to 20 inches below the surface.

Limestone fragments are on and in the soil. The amount, by volume, is few to about 35 percent. These soils are slightly acid to mildly alkaline.

Speck clay loam, 1 to 3 percent slopes (SpB).—This gently sloping soil is on uplands. Slopes are plane to convex. Only a few limestone fragments are on the surface and in the soil.

This soil has the profile described as representative for the Speck series.

Mapped with this soil are small areas of outcropping bedrock and of very shallow soils. These are elongated strips 1 or 2 acres in size. They make up less than 1 percent of the acreage. Also included are intermixed spots of soils like Speck clay loam, except they are deeper than 20 inches over limestone. These spots make up 10 to 15 percent of some mapped areas.

About half of the acreage of this Speck clay loam is cultivated. Capability unit IIIe-3; Redland range site.

Speck and Tarrant soils, undulating (SRB).—This undifferentiated mapping unit consists dominantly of Speck and Tarrant soils in areas 20 to 300 acres in size. The composition of this unit is more variable than that of most others in the county, but mapping was detailed enough to allow interpretation for the expected uses of the soils.

Speck soils make up about 50 percent of the unit, but the range is from 30 percent to 70 percent. Tarrant soils are estimated at about 15 percent, but the range is from 10 to 25 percent. Included in this mapping unit are soils like Speck, except their depth to limestone ranges from 20 to 40 inches. Limestone fragments and stones range from a few to numbers sufficient to cover 20 percent of the surface of this mapping unit. Slopes are mainly about 2 percent, but the range is from nearly level to about 8 percent on some short slopes.

The Speck soils have a surface layer of brown clay loam about 7 inches thick. Below the surface layer is reddish-brown clay about 8 inches thick. The underlying material, extending to a depth of about 20 inches, is hard limestone. Speck clay loam forms the background of the soil pattern in this mapping unit. Other soils are scattered on this background.

The Tarrant soils have a dark-brown clay surface layer. It is about 12 inches thick and is about 55 percent limestone fragments. The underlying material, extending to a depth of 24 inches, is hard limestone. These stony Tarrant soils are mainly on slight rises in oval to crescent-shaped areas that are less than 1 acre to as much as 12 acres in size.

The soils that are deeper than Speck are mainly in streaks and pockets less than 1 acre in size. These deeper soils and Speck soils contain scattered intermittent spots that are not stony.

All of this mapping unit is in range. Both soils in capability unit VIe-3; Speck part in Redland range site; Tarrant part in Low Stony Hills range site.

Stony Land

The Stony land mapping unit is a mixture of rock fragments and soil material. This land type, together with Owens soils, makes up part of generally east-facing scarps that are scattered throughout most of the county. In association with Somervell soils, it forms part of the moderately steep hillsides. It is mostly in narrow strips or small areas as a part of an undifferentiated or complex mapping unit.

Where this land type is on the upper part of the hillside, 15 to 90 percent of the surface is covered with stones. The areas are generally less stony at lower levels, and between 3 and 15 percent of the surface is covered with stones. Where it is at the top of the slope, the soil material is mainly pockets of gravelly and cobbly clay between the rock fragments.

The less stony areas, lower on the slopes, are mainly a mixture of clays and rock fragments that have been moved into place through gravity, soil creep, and local wash. These are underlain by shales and soft limestone.

This mapping unit has a low available water capacity, and runoff is rapid. The hazard of erosion is high.

Stony land and Owens soils, moderately steep (STE).—This undifferentiated mapping unit consists of moderately steep areas of generally east-facing scarps. The composition of this unit is more variable than that of most others in the county, but mapping was detailed enough to interpret the soils for expected uses. Slopes are dominantly 12 to 15 percent, but some slopes of 6 to 12 percent and 15 to 45 percent are included. The mapped areas are 0.5 to 4 miles long and 200 to 1,200 feet wide. They run generally north and south or conform to the drainage pattern and form the valley walls of local streams.

The stony land component makes up the major part of most mapped areas. At the highest elevations it is very stony and was derived from a broken layer of hard rock that resists erosion and forms a scarp. Lower down, it is less stony and is a mixture of rock fragments and soil material that has been moved into place through gravity, soil creep, and local wash. Stony land usually makes up about 75 percent of this mapping unit, but the percentage varies from area to area.

The Owens soils have the profile described as representative for the series.

The Owens part of this mapping unit is mainly on the lower one-fourth of the slopes. These soils extend to near the top in places, and occupy strips in other places. Rock fragments cover 3 to about 15 percent of the surface. Gullied areas of shaly clay or calcareous fine earth are included in this mapping unit.

This mapping unit is used for range. Both soils in capability unit VIIs-1; Stony land part in Rocky Hills range site; Owens part in Shaly Hills range site.

Talpa Series

The Talpa series consists of undulating, shallow to very shallow soils that overlie limestone. These soils are on uplands.

In a representative profile, the surface layer is grayish-brown clay loam, about 8 inches thick, that contains a few limestone cobbles and stones. Below this is hard limestone that has a discontinuous coating of caliche.

The Talpa soils are well drained, and surface runoff is rapid. Their available water capacity is low, and permeability is moderate.

In Coleman County, the Talpa soils are mapped only in association with the Kavett soils.

Representative profile of Talpa clay loam, in an area of Kavett and Talpa soils, undulating, in range, 1.75 miles south of the Santa Fe Railroad in Talpa, Tex., and 200 feet east of the Runnels-Coleman County line. This site is 18.6 miles south and 70° west of the Coleman County Courthouse in Coleman:

A1—0 to 8 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, very fine, subangular blocky and granular structure; hard, firm; few caliche fragments 0.125 to 0.5 inch in diameter; few limestone cobbles and stones; calcareous; moderately alkaline; abrupt, wavy boundary.

R—8 to 10 inches, hard limestone; 1 to 2 inches of discontinuous caliche coating on the upper surface of the bedrock, and in the cracks and crevices.

The soil ranges from 6 to 20 inches in thickness and from grayish brown to dark grayish brown and brown in color. It is about 10 to 30 percent coarse fragments.

Tarrant Series

The Tarrant series consists of clayey, shallow to very shallow, stony soils that overlie fractured limestone bedrock. These undulating soils are on uplands.

In a representative profile, the surface layer is dark grayish-brown clay in the upper 6 inches. To this depth, it is about 10 percent, by volume, limestone pebbles. The lower 8 inches is brown and about 80 percent limestone fragments. Below this is limestone bedrock (fig. 7).

These soils are well drained, and their permeability is slow. The available water capacity is low.

Representative profile of Tarrant clay, in an area of Tarrant soils, undulating, in range, 75 feet east of a point on a county road that is 0.4 mile west of the entrance to the Hords Creek Reservoir Dam on Farm Road 53, then 1.5 miles north and west on the county road. This site is 10 miles north and 68° west of the Coleman County Courthouse in Coleman:

A11—0 to 6 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; moderate, very fine, subangular blocky structure; hard, firm; about 10 percent, by volume, limestone pebbles; few worm channels and worm casts; calcareous; moderately alkaline; clear, wavy boundary.

Figure 7.—Profile of Tarrant stony clay.

A12—6 to 14 inches, brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) when moist; moderate, very fine, subangular blocky and blocky structure; hard, firm; about 80 percent, by volume, limestone fragments, mostly 2 to 3 inches thick and 4 to 10 inches wide; calcareous; moderately alkaline; abrupt, irregular boundary.

R—14 to 16 inches, fractured limestone bedrock; hardness of 3 or more on Mohs' scale; roots in crevices at this depth, but there is apparently less than 5 percent soil below a depth of 14 inches.

The soil ranges from very dark grayish brown to brown in color and from 6 to 20 inches in thickness. The layers of underlying hard limestone range from a few inches to several feet in thickness. These layers are interbedded with soft rock that is shaly clay to soft impure limestone. The soil is more than 35 percent, by volume, limestone fragments. Clay content is 40 to 60 percent.

Tarrant soils, undulating (TAB).—This mapping unit consists of undulating soils that are mainly on uplands. The composition of this mapping unit is more variable than most other mapping units in the county, but mapping was detailed enough to interpret the soils for expected uses.

Slopes range from about 1 to 8 percent but are dominantly about 2 percent. The landscape has contour strips 50 to 150 feet wide that have 25 to 50 percent of their surface covered with stones and boulders. These strips are at intervals of 200 to 1.200 feet and make up 5 to 15 percent of the area. Between the strips, the amount of the surface covered by limestone pebbles and cobbles ranges from 1 to 25 percent.

These Tarrant soils have the profile described as representative for the series.

Included in this mapping unit are intermixed areas of soils that are like Tarrant soils except they are sandier and thinner. These areas cover 25 to 30 percent of the acreage.

All of this mapping unit is in range. Capability unit VIe–3; Low Stony Hills range site.

Tarrant and Purves soils, undulating (TPB).—This mapping unit consists of undifferentiated, undulating soils on uplands. The composition of this mapping unit is more variable than that of most other mapping units in the county, but mapping was detailed enough to allow interpretation for expected uses of the soils.

In most places, this unit is about 50 percent Tarrant soils, but these soils can range from 20 to 75 percent of the acreage. Purves soils range from 20 to 65 percent, and Kavett soils 5 to 15 percent. Mapped areas are irregular and 10 to several hundred acres in size. They average about 200 acres in size. The smaller mapped areas are associated with Valera, Tobosa, and other areas of arable land. A typical large area of this mapping unit is formed of alternating strips of Tarrant and Purves soils. These strips are mainly 100 to 600 feet in width, range to as much as a mile or more in length, and lie approximately on the contour. Some strips or ridges within the larger mapped areas are mainly Tarrant soils that are 10 to 20 percent intermixed areas of Purves soils. Individual areas of Tarrant or Purves soils range from less than an acre to about 30 acres in size.

The Tarrant soils have a surface layer of brown clay, about 14 inches thick, that is about 80 percent limestone fragments. Limestone fragments cover from 1 to 50 percent of the surface area. The fragments range in size from pebbles to boulders. The underlying material, extending to a depth of about 24 inches, is limestone.

These Purves soils have the profile described as representative for the series. About half of these soils are stony and cobbly.

Kavett soils are in small bodies intermixed with the Purves and Tarrant soils.

Included in this mapping unit are minor areas of other soils, mainly Valera clay and Tobosa clay, in areas that range to 10 acres in size. They account for as much as 10 percent of some mapped areas.

All of this mapping unit is in range. Both soils in capability unit VIe–3; Tarrant part in Low Stony Hills range site; Purves part in Shallow range site.

Tobosa Series

The Tobosa series consists of deep, clayey, nearly level to gently sloping soils on uplands.

In a representative profile, the surface layer is clay about 26 inches thick. It is very dark grayish brown in the upper part and brown in the lower part. The next layer is brown clay about 24 inches thick. The underlying material, extending to a depth of about 72 inches, is reddish-yellow silty clay.

These soils are well drained and very slowly permeable. Runoff is medium, and the available water capacity is high.

Representative profile of Tobosa clay, 1 to 3 percent slopes, in a cultivated field 780 feet east of the Coleman Municipal Airport runway and 180 feet south of the field boundary at a county road. This site is 1.5 miles north and 41° east of the Coleman County Courthouse in Coleman:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; weak, very fine and fine, granular structure; hard, firm; few chert pebbles and few limestone pebbles; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—6 to 26 inches, brown (10YR 4/3) clay, dark brown (10YR 3/3) when moist; moderate, very fine, blocky structure; very hard, firm; few limestone and siliceous pebbles; few soft lumps of lime, mostly 0.125 to 0.25 inch in width; calcareous; moderately alkaline; gradual, wavy boundary.

AC—26 to 50 inches, brown (10YR 5/3) clay, brown (10YR 4/3) when moist; moderate, fine and medium, blocky structure; few intersecting slickensides; very hard, very firm; few soft lumps of lime about 0.25 inch in width; few, small limestone and quartz pebbles; calcareous; moderately alkaline.

Cca—50 to 72 inches, reddish-yellow (7.5YR 6/6) silty clay; massive; hard, firm; about 10 percent, by volume, white soft lime in pockets and streaks.

The A horizon ranges from dark grayish brown to brown in color and from 12 to about 30 inches in thickness. Uncultivated areas contain micropits 6 to 18 inches in depth.

The AC horizon ranges from grayish brown to pale brown in color.

The C horizon is clayey earth that contains segregated lime in concretions or soft lumps. These concretions and lumps range from few to about 20 percent of the volume.

The Cca horizon is 41 to 60 inches below the surface; clay content is 45 to 60 percent.

Tobosa clay, 0 to 1 percent slopes (ToA).—This nearly level soil is on uplands in irregular areas mostly 20 to 250 acres in size. Slopes are dominantly about 0.5 percent.

In a representative profile, the surface layer is dark grayish-brown clay about 20 inches thick. The next layer is brown clay about 22 inches thick. The underlying material, extending to a depth of about 64 inches, is silty clay.

Most of this Tobosa clay is cultivated. Capability unit IIs-1; Deep Upland range site.

Tobosa clay, 1 to 3 percent slopes (ToB).—This gently sloping soil is on uplands in irregular areas 10 to 350 acres in size. Slopes are mostly 1 to 2 percent.

This soil has the profile described as representative for the Tobosa series.

Mapped with this soil are a few shallow gullies and a few areas that have been covered by overwash from the eroded spots.

Most of this Tobosa clay is cultivated. The hazard of erosion is moderate. Capability unit IIIe-2; Deep Upland range site.

Valera Series

The Valera series consists of gently sloping, moderately deep, clayey soils that overlie limestone and caliche on uplands.

In a representative profile, the surface layer is clay about 22 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The next layer is brown clay about 6 inches thick. The underlying material is very pale brown silty clay loam, about 7 inches thick, that overlies cemented caliche and limestone fragments.

These soils are well drained, and their permeability is moderately slow. The available water capacity is high, and runoff is medium. The hazard of erosion is moderate.

Representative profile of Valera clay, 1 to 3 percent slopes, 175 feet west of a point on a county road that is 2.4 miles north of Fisk, Tex., by Farm Road 1026, then 1.5 miles east and 0.2 mile north on the county road. This site is 8.2 miles south and 12° west of the Coleman County Courthouse in Coleman:

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; weak, very fine and fine, granular structure; hard, firm; few siliceous and limestone pebbles 0.25 to 3 inches in diameter; calcareous; moderately alkaline; abrupt, smooth boundary.

A11—5 to 11 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure; hard, firm; few siliceous and limestone pebbles; few insect burrows and fine pores; crushed color slightly higher in value and chroma than ped surfaces; calcareous; moderately alkaline; gradual, smooth boundary.

A12—11 to 22 inches, brown (10YR 4/3) clay, dark brown (10YR 3/3) when moist; moderate, fine, subangular blocky structure; hard, firm; few small siliceous pebbles; few worm casts; calcareous; moderately alkaline; gradual, wavy boundary.

AC—22 to 28 inches, brown (10YR 4/3) clay, dark brown (10YR 3/3) when moist; moderate, fine, subangular blocky structure; hard, firm; 10 percent calcium concretions and caliche-coated pebbles; calcareous; moderately alkaline; clear, wavy boundary.

C1ca—28 to 35 inches, very pale brown (10YR 8/3) silty clay loam, light yellowish brown (10YR 6/4) when moist; massive; hard, firm; about 50 percent soft white segregated lime; few calcium concretions; few limestone pebbles.

C2cam—35 to 58 inches, limestone fragments 2 to 4 inches in width embedded in cemented caliche; cemented coatings on the limestone fragments range from less than 0.25 inch on the upper side to about 0.5 inch on the under side.

The A horizon ranges from very dark grayish brown to brown in color and from about 12 to 36 inches in thickness. The AC horizon ranges from very dark brown to yellowish brown in color and from 0 to 20 inches in thickness.

The C1ca horizon is dark brown to yellow and 6 to 12 inches thick. The C2cam horizon ranges from caliche-coated hard limestone to limestone rubble embedded in strongly cemented caliche.

The underlying layer of hard limestone and cemented caliche is 20 to about 40 inches below the surface.

These soils are 40 to 55 percent clay.

Valera clay, 1 to 3 percent slopes (VcB).—This soil is in irregular areas 10 to 150 acres in size.

The variation in depth to limestone from the surface is caused by alternate layers of hard and soft rock that underlie this soil in overlapping steplike layers on side slopes.

Mapped with this soil are soils that have limestone at depths of more than 40 inches. They make up as much as 40 percent of some mapped areas. Another inclusion is small, usually rounded spots of Tobosa clay in depressed areas that range from about 30 feet across to 3 or 4 acres in size. These depressions make up about 5 percent of some mapped areas. Small areas of Kavett silty clay, in most places elongated and on a slight rise or at a break in the slope, form about 8 percent of some areas. These areas range from less than 0.1 acre to as much as 3 or 4 acres in size.

Most of this Valera clay is cultivated. Capability unit IIe-3; Deep Upland range site.

Weymouth Series

The Weymouth series consists of loamy, calcareous soils on uplands. These soils are moderately deep and gently sloping to sloping and undulating.

In a representative profile, the surface layer is brown loam about 5 inches thick. The next layer is reddish-brown loam about 27 inches thick. The lower part is reddish yellow and is about 5 percent lime concretions. The underlying material, extending to a depth of 54 inches, is reddish-brown and light-gray, weakly cemented sandstone.

These soils are well drained, and their permeability is moderate. The available water capacity is moderate, and runoff is medium to rapid.

Representative profile of Weymouth loam, 1 to 3 percent slopes, in a cultivated field, 75 feet west of a point on a county road that is 3.8 miles west of Valera, Tex., via U.S. Highway 67, then 0.3 mile south on the county road. This site is 12.2 miles west and 65° south of the Coleman County Courthouse in Coleman:

Ap—0 to 5 inches, brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) when moist; weak, very fine, granular structure; hard, friable; few small lime concretions; calcareous; moderately alkaline; abrupt, smooth boundary.

B2—5 to 14 inches, reddish-brown (5YR 5/4) loam, reddish brown (5YR 4/4) when moist; moderate, very fine, subangular blocky and granular structure; hard, friable; few small lime concretions; films and threads of lime; calcareous; moderately alkaline; gradual, wavy boundary.

B3ca—14 to 32 inches, reddish-yellow (5YR 7/6) loam, reddish yellow (5YR 6/6) when moist; weak, fine, subangular blocky structure; about 5 percent lime concretions; calcareous; moderately alkaline; gradual, wavy boundary.

C—32 to 54 inches, reddish-brown and light-gray, weakly cemented, calcareous sandstone; massive; hard, firm; few lime concretions and lime coatings in parting or cleavage planes.

The A horizon ranges from brown to reddish brown in color. The B horizon ranges from dark reddish brown to reddish yellow in color. Depth to the C horizon is 20 to 40 inches. The soil above the C horizon is about 10 to 20 percent segregated lime in the form of concretions, soft lumps, films, and threads. The C horizon is weakly cemented sandstone to structureless loamy and clayey earth.

Weymouth loam, 1 to 3 percent slopes (WeB).—This soil is in irregular areas 10 to 60 acres in size. Slopes are dominantly about 1.5 percent but range from 1.25 to 3 percent.

This soil has the profile described as representative for the Weymouth series.

Included in most mapped areas of this soil are small rounded spots of calcareous loamy soils that are shallow to very shallow and have 10 to 30 percent caliche fragments and limestone fragments on the surface and in the soil. These are mostly at the tops of low ridges or on slope breaks, and they are less than 2 acres in size. These spots and intermixed patches of Portales soils make up 15 to 20 percent of some mapped acreage.

Some of this Weymouth loam is cultivated, but most is in range. This soil is best suited to grass, and some old fields have been returned to pasture or range. Capability unit IIe–4; Shallow range site.

Weymouth-Portales complex, 1 to 3 percent slopes (WpB).—This mapping unit is mainly on foot slopes of the limestone hills. The areas are gently sloping and have plane to convex surfaces. Slopes are mostly about 1.5 percent. Mapped areas are irregular and range from about 10 to 100 acres in size. Texture of the surface layer of the Weymouth and the Portales soils ranges from clay loam to loam.

A representative area of this complex mapping unit is made up of about 45 percent Weymouth soils and 45 percent Portales soils. The Weymouth soils are on the ridgetops and higher elevations in areas that range from less than a hundred feet wide to about 2 acres in size, and on the side slopes, they are also in contour strips 50 to 100 feet wide. The Portales soils occupy most of the lower elevations. Portales soils are in irregular areas as much as 5 acres in size, or they form the background for intermixed, scattered areas of Weymouth soils.

Weymouth soils have a surface layer of brown clay loam about 5 inches thick. The next layer is reddish-brown clay loam about 20 inches thick. The underlying material, extending to a depth of about 60 inches, is clayey earth.

This Portales soil has the profile described as representative for the series.

Included in this mapping unit are small rounded spots of calcareous loamy soils that are shallow to very shallow. These soils have 10 to 30 percent of their surface covered by caliche fragments and limestone fragments and about the same percentage of fragments in their profile. These and small areas of Rowena clay loam make up as much as 10 percent of some mapped areas.

Both the Weymouth and Portales soils are moderately permeable and are subject to a moderate hazard of erosion.

About half of this mapping unit is cultivated. Both soils in capability unit IIe–4; Portales part in Deep Upland range site; Weymouth part in Shallow range site.

Weymouth and Menard soils, undulating (WMB).—This is a gently sloping to sloping and undulating mapping unit that lies below steeper slopes. Slopes are dominantly about 6 percent, but range from about 2 to 8 percent.

The composition of this mapping unit is more variable than that of most others in the county, but mapping was detailed enough to interpret for the expected uses of the soils.

A representative area of this mapping unit has about 45 percent Weymouth soils and 35 percent Menard soils. The Weymouth soils are on the ridgetops and in contour strips on the side slopes. The Menard soils are on side slopes and in shallow valley positions. Areas of the individual soils range from 1 acre to about 12 acres in size. About 25 to 50 percent of the acreage of Menard soils in this mapping unit have outcropping sandstone or stones and boulders that cover 1 to 3 percent of the surface.

This Weymouth soil has a surface layer of brown loam about 6 inches thick. The next layer is reddish-brown loam about 18 inches thick. The underlying material, extending to a depth of about 60 inches, is reddish-brown loam.

This Menard soil has a surface layer of brown fine sandy loam about 6 inches thick. The next layer is sandy clay loam, about 24 inches thick, that is red in the upper part and yellowish red in the lower part. The underlying material, extending to a depth of about 60 inches, is reddish-yellow loam.

Included in this mapping unit are areas of gravelly and cobbly, calcareous, loamy soils. These very shallow to shallow soils are underlain by layers of calcareous weakly cemented sandstone, clayey marls, and thin limestone. These areas are intermixed with the Weymouth soils on the ridgetops and side slopes. Other inclusions are mainly small areas of Pedernales fine sandy loam near the heads of small drainageways or intermixed with the Menard soils.

This mapping unit is subject to a moderate to high hazard of erosion. Both soils in capability unit VIe–2; Weymouth part in Shallow range site; Menard part in Sandy Loam range site.

Winters Series

This series consists of loamy, nearly level to gently sloping soils on uplands.

In a representative profile, the surface layer is brown fine sandy loam about 6 inches thick. The layers, in sequence from the top, are 26 inches of reddish-brown clay, 6 inches of light reddish-brown, calcareous clay loam, and 24 inches of light-brown, calcareous clay loam.

These soils are well drained and moderately slowly permeable. They have high available water capacity.

Representative profile of Winters fine sandy loam, 1 to 3 percent slopes, in a cultivated field, 0.75 mile east and 500 feet north of the intersection of Texas Highway 206

and Farm Road 1176. This intersection is approximately 8.6 miles north and 48° east of the Coleman County Courthouse in Coleman:

Ap—0 to 6 inches, brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 3/4) when moist; weak, fine, granular and very fine, subangular blocky structure; slightly hard, very firm; neutral; abrupt, smooth boundary.

B1—6 to 9 inches, reddish-brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) when moist; moderate, fine, blocky structure; hard, firm; mildly alkaline; clear, smooth boundary.

B21t—9 to 26 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) when moist; moderate, fine, blocky structure; very hard, very firm; continuous clay films on ped surfaces; mildly alkaline; gradual, smooth boundary.

B22t—26 to 32 inches, reddish-brown (5YR 5/4) clay, reddish brown (5YR 4/4) when moist; moderate, fine, blocky structure; very hard, very firm; continuous clay films on ped surfaces; calcareous; moderately alkaline; gradual, smooth boundary.

B23t—32 to 38 inches, light reddish-brown (5YR 6/4) clay loam, reddish brown (5YR 5/4) when moist; moderate, fine, blocky structure; hard, firm; few fine spots and concretions of calcium carbonate; calcareous; moderately alkaline; gradual boundary.

B3ca—38 to 62 inches, light-brown (7.5YR 6/4) clay loam, reddish brown (7.5YR 5/4) when moist; weak, very fine, blocky structure; hard, firm; about 30 percent segregated whitish lime in concretions and soft lumps.

The A horizon ranges from reddish brown to dark brown in color and from 4 to 12 inches in thickness. The B horizon ranges from red to reddish brown in color, from 48 to 60 inches in thickness, and from clay to clay loam in texture. The B3ca horizon is 30 to 50 inches below the surface.

These soils in Coleman County are outside the defined range for the Winters series in that they have a clay B2t horizon.

Winters fine sandy loam, 0 to 1 percent slopes (WtA).—This nearly level soil is on upland stream terraces. Soil areas are irregular and 20 to 250 acres in size. Slopes are dominantly about 0.5 percent.

The surface layer is brown fine sandy loam about 6 inches thick. The next layer is reddish-brown clay loam about 30 inches thick. The next layer, extending to a depth of about 66 inches, is light-brown clay loam.

Mapped with this soil are small rounded to oval areas of calcareous soils that are loamy and gravelly. These spots are mostly less than two acres in size and make up 3 to 5 percent of the acreage. Small, rounded or elongated, slightly depressed spots of Abilene clay loam are in some mapped areas. These make up less than 5 percent of the acreage.

More than half of this Winters fine sandy loam is cultivated. Runoff is medium, and the hazard of erosion is slight. Capability unit IIc–6; Tight Sandy Loam range site.

Winters fine sandy loam, 1 to 3 percent slopes (WtB).—This gently sloping soil is dominantly on upland stream terraces. Soil areas are irregular and 20 to 300 acres in size. Slopes are plane to convex and dominantly about 1.7 percent.

This soil has the profile described as representative for the Winters series.

Mapped with this soil are rounded areas of calcareous soils that are loamy and gravelly. These are mostly 15 to 200 feet in width and range to as much as 2 acres in size. Also included are similarly sized areas of Abilene clay loam in rounded or elongated, slightly depressed areas. These inclusions make up less than 10 percent of the acreage.

More than half of this Winters fine sandy loam is cultivated. Runoff is medium, and the hazard of erosion is moderate. Capability unit IIIe–6; Tight Sandy Loam range site.

Yahola Series

The Yahola series consists of calcareous loamy soils of the flood plains.

In a representative profile, the surface layer is brown fine sandy loam about 5 inches thick. The underlying material is stratified, brown to reddish-brown and reddish-yellow fine sandy loam that extends to a depth of about 60 inches.

These soils are well drained and moderately rapidly permeable. The available water capacity is high, and runoff is slow.

Representative profile of Yahola fine sandy loam in a cultivated field, in a bend of the Colorado River, 900 feet north of the river channel and 550 feet east of the field boundary. This field is 1.6 miles south of the ranch headquarters, which is 1.8 miles south of a point on a county road at the ranch entrance. This point is 0.6 mile west of Gouldbusk, Tex., by Farm Road 1026, then 5.6 miles south, 1 mile west, and 0.5 mile south on the county road. This site is approximately 28 miles south and 8° west of the Coleman County Courthouse in Coleman:

Ap—0 to 5 inches brown (7.5YR 5/4) fine sandy loam, dark brown (10YR 4/4) when moist; massive; slightly hard, very friable; few fine roots; fragments of surface crust that have thin streaks of sand; few worm casts; calcareous; moderately alkaline; abrupt, smooth boundary.

C1—5 to 16 inches, brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) when moist; massive; slightly hard, very friable; few fine roots; few worm casts; common, fine and medium pores; calcareous; moderately alkaline; clear, smooth boundary.

C2—16 to 26 inches, reddish-brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) when moist; massive; slightly hard, very friable; few fine roots; few worm casts; few threads and films of lime; few pores; calcareous; moderately alkaline; gradual, smooth boundary.

C3—26 to 60 inches, reddish-yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 4/6) when moist; massive; slightly hard, very friable; few films and threads of lime that increase in number with depth; few, fine and medium pores; faint bedding planes, calcareous, moderately alkaline.

The A horizon ranges from dark reddish gray to brown and reddish brown in color and from fine sandy loam to very fine sandy loam or silt loam in texture. The C horizon ranges from reddish brown to reddish yellow in color.

Yahola fine sandy loam (Ya).—This soil is in the flood plains of rivers. Soil areas are irregular and 20 to 100 acres in size. Slopes dominantly are about 0.7 percent but range from 0.4 to 2 percent. This soil is subject to occasional overflow.

This soil has the profile described as representative for the Yahola series.

Most of this soil is cultivated. Capability unit IIc–1; Bottomland range site.

Yahola and Clairemont soils, strongly sloping (YCD).—This mapping unit is in bottom lands near deeply

entrenched channels of rivers and streams. Mapped areas range from about 200 to 1,200 feet in width but average about 500 feet in width. They are from about 20 to several hundred acres in size. They are in nearly continuous strips along the rivers and extend up most of their tributaries for a short distance.

The height from the bottom of the river channel to the highest levels in the mapping unit ordinarily is in the range of 50 to 60 feet but in some places the range is from 30 to 80 feet. The rise in elevation from the channel typically is in two or more steps, and there is one or more benches. The steps range from nearly vertical banks to slopes of about 6 percent, but slopes are typically between 12 and 20 percent.

Mapped areas are made up of an estimated 58 percent Yahola soils and 30 percent Clairemont soils. The composition is more variable than that of most other mapping units in the county, but mapping was detailed enough to interpret the soils for expected uses. Unclassified soils of the bottom lands that are too clayey or too sandy for the Yahola or Clairemont series make up about 12 percent of the acreage.

The lower lying benches and steps are dominantly Yahola soils. The Yahola soils that are on low lying benches near the river channel have undulating surfaces and are frequently flooded. Most of these benches are less than 200 feet in width and range to as much as 0.5 mile in length. A few are 20 to 60 acres in size. The higher lying benches range from less than an acre to about 12 acres in size.

Yahola soils have a reddish-brown fine sandy loam, silt loam, or very fine sandy loam surface layer that is about 6 inches thick. The underlying layers are reddish-yellow fine sandy loam that extends to a depth of more than 60 inches.

Upper parts of the mapped areas are dominantly Clairemont soils. Clairemont soils are also on the irregularly shaped ridgetops isolated by deep stream channels and steeply sloping steps.

Clairemont soils have a yellowish-red silt loam surface layer about 6 inches thick. The underlying layers, extending to a depth of about 60 inches, are stratified fine sandy loam and silty clay loam.

All of the mapping unit is in range. In many places, overfall gullies present a severe problem of erosion control. Capability unit VIe-1; River Breaks range site.

Use and Management of the Soils

This section discusses use of the soils for crops and pasture and practices for controlling erosion and main-

Figure 8.—Parallel terraces on Abilene clay loam and Olton clay loam are enabling use of newer and better farm equipment.

taining fertility. It explains the nationwide capability classification system used by the Soil Conservation Service, and a table showing predicted yields of the principal crops. Also discussed is use and management of the soils for range, wildlife, and engineering.

Use of the Soils for Crops and Pasture

Control of erosion, conservation of moisture, and maintenance of fertility are the main objectives of the management practices that are described briefly in the following paragraphs. Erosion is one of the main hazards in Coleman County. In more than 90 percent of the county, the slope is steeper than 1 percent. Consequently, most of the soils are subject to accelerated water erosion if they are cultivated.

The type and intensity of management needed vary according to the kind of soil and the type of agricultural enterprise. Local representatives of the Soil Conservation Service and the Extension Service are available to help determine management needs and plan the application of practices on specific farms and ranches.

Controlling erosion

Wherever the plant cover is removed by cultivation, the soil is subject to erosion by rainfall and runoff. The degree of erosion depends on the force with which raindrops stir up the soil and on the amount and speed of runoff. These depend, in turn, on the vegetation, the texture and structure of the soil, and the length and steepness of slopes (*9*).

To control water erosion, it is necessary to reduce runoff. Contour farming, terracing, grassed waterways, selected cropping systems, proper use of crop residues, and proper tillage help reduce runoff.

Contour farming consists of plowing, planting, and tilling across the slope at a constant elevation. The objective is to hold water where it falls, which reduces runoff and helps control erosion and conserve soil moisture. All terraced fields should be farmed on the contour. Nearly level fields do not need to be terraced, but they benefit from contour farming.

Terrace ridges serve as guidelines for contour farming. Where there are no terraces, contour lines can be laid out with an engineer's level.

Terracing reduces runoff, which helps control erosion and conserve moisture, or diverts surplus water from cropland or other areas that require protection. Sloping fields that are cultivated need to be protected by terraces that divert water to a pasture or a protected waterway. These terraces should be on the contour and parallel to each other, and they should have a uniform grade. For protection of the terrace system, terraced fields should be farmed on the contour or parallel to the terraces (fig. 8).

The contour lines for terraces should be laid out by means of an engineer's level. Technical assistance can be obtained from a local representative of the Soil Conservation Service.

Grassed waterways carry outside or surplus water across a farm in such a way that it will not cause erosion (fig. 9).

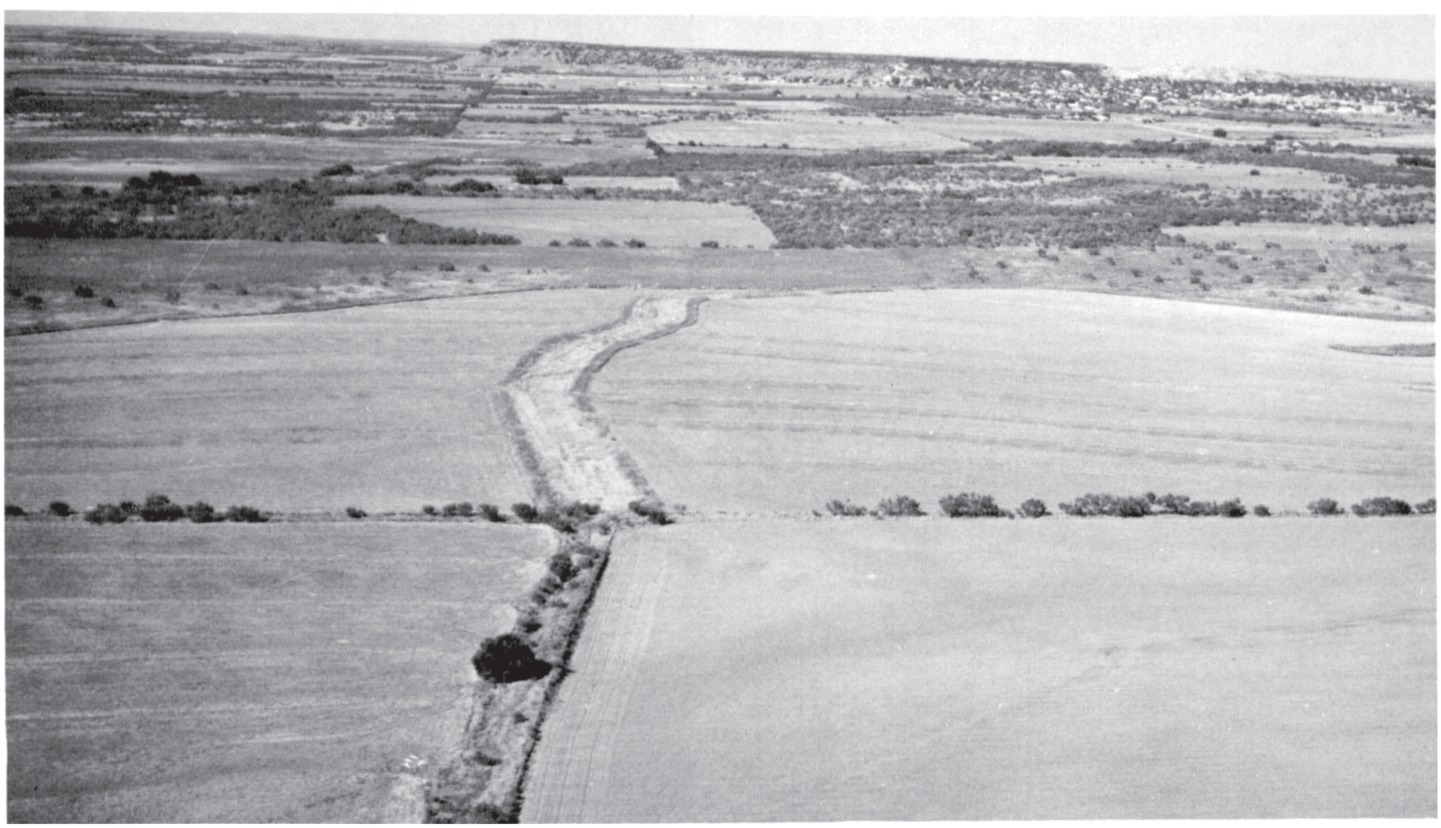

Figure 9.—**Grassed waterway provides safe outlet for parallel terrace system on Tobosa clay, 1 to 3 percent slopes.**

The design and preparation of a waterway require careful study. After the course of a waterway is selected, the channel must be shaped to the proper dimensions, then seeded or sodded with a suitable grass. Grassed waterways may be used for hay, seed production, or grazing. When used for grazing, care must be taken to keep enough grass to protect the soil during heavy rains. Waterways should not be used as roadways or as livestock lanes.

If the slope is slight and the soils are suitable, drilled small grain or sorghum can be planted in a waterway instead of grass. Such crops should not be allowed to make seed, but they should be cut before maturity and used as a litter crop.

Technicians of the Soil Conservation Service and other agencies can give advice and assistance in the planning and construction of grassed waterways.

Cropping systems maintain or improve the tilth of the soil, protect the soil when erosion is most likely to occur, aid in the control of weeds, insects, and diseases, and provide an adequate economic return.

Basically, a good cropping system consists of growing crops in a sequence or in a rotation in which soil-improving crops balance soil-depleting crops in their effect on the soil.

Management of residue is an effective practice. A good litter of crop residue kept on the surface protects the soil against packing rains, reduces crusting, decreases runoff, and reduces evaporation of soil moisture. It shades the soil and thus reduces soil temperature. In addition, it adds organic matter to the soil, improves the tilth of the surface soil, and reduces packing by farm machinery. Residue properly managed provides cover on the land in the absence of growing plants.

Crop residues should be protected from grazing and burning. Tillage equipment that keeps residue on the surface should be used (fig. 10).

***Figure 10.*—A good litter of crop residue from small grain on Abilene clay loam.**

Tillage is a means of controlling erosion. The soil should be tilled only enough to prepare a good seedbed and to control weeds. Tillage of wet soil destroys the soil structure and causes a plowpan to form. Poor structure limits water intake and reduces the air space in the soil. A plowpan restricts the growth of roots. It also slows water penetration and causes an increase in runoff and erosion.

Maintaining fertility

The fertility of most cropland is related to the amount of organic matter in the soil. Most of the soils in Coleman County that have been cropped intensively for a long time are low in organic matter and need nitrogen and phosphorus. Some of the more sandy soils need potassium. These elements can be supplied by applying commercial fertilizer. Applications should be based on needs determined by soil tests. The amount and type needed vary according to the nature of the soil, the crop to be grown, the previous crop, the season of the year, and the amount of available moisture. For row crops, it is usually best to band the fertilizer below and to the side of the seed. Crops in Coleman County respond to fertilizer in most years.

Practices designed to control erosion help maintain the organic matter content and the fertility of soils used for tilled crops. Management practices that return residues, such as those from small grain and sorghums, help to maintain the organic matter cycle in the soil. Other organic materials, such as cotton hulls, can be used to add to the supply. Commercial fertilizer helps decompose the organic material, and in this process, nutrients are released for use by growing plants. Commercial fertilizer, by increasing plant growth, also helps increase the amount of residue that can be returned to the soil.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or engineering.

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

Capability Classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use. (No Class I soils in Coleman County.)

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units in Coleman County are described and suggestions for the use and management of the soils are given. The capability unit designation for all the soils in the county can be found in the "Guide to Mapping Units." The suitability of each soil for crops, as well as suggestions for its management, is given under the heading "Descriptions of the Soils." The capability unit is identified at the end of each soil description.

CAPABILITY UNIT IIe-1

This unit consists of gently sloping soils that have a fine sandy loam surface layer and sandy clay loam lower layers. These soils are subject to a slight to moderate hazard of erosion.

These soils are well suited to small grains, sorghum, and cotton. Terraces and contour farming help control runoff and erosion. Fertilizer helps maintain fertility and increases the amount of crop residue, which is needed to maintain organic matter and protect the soils from erosion.

CAPABILITY UNIT IIe-2

The gently sloping soils of this unit have loam and clay loam surface layers and slowly to moderately slowly permeable lower layers. They are subject to a moderate hazard of erosion and have a moderate to high available water capacity.

The soils are well suited to small grains, sorghum, and cotton. Terracing and contour farming help control runoff and erosion. Cropping systems that return large amounts of residue to the soil help maintain productivity and tilth.

CAPABILITY UNIT IIe-3

The gently sloping soils of this unit have clay to clay loam surface layers and are slowly to moderately slowly permeable. They are subject to a moderate hazard of erosion and have a high available water capacity.

These soils are well suited to small grains, sorghum, and cotton. Practices, such as terracing, contour farming, and cropping systems, that return large amounts of residues to the soil, help to conserve moisture, control erosion, and maintain or improve productivity and tilth.

CAPABILITY UNIT IIe-4

These gently sloping soils have loamy surface layers and are moderately deep. They are subject to a moderate hazard of erosion.

The soils are in small grain and sorghum. A cropping system that includes small grains and grain sorghum will return large amounts of residue to the soil and thus maintain organic matter in the soil, improve tilth, and protect against erosion. Terraces and contour farming also are needed to help to control runoff and erosion.

CAPABILITY UNIT IIs-1

This unit consists of soils that have clay and clay loam surfaces. These soils are very slowly and moderately slowly permeable. They crack deeply when dry. They have a high available water capacity, and runoff is slow.

These soils are well suited to small grains, grain sorghum, and cotton. A good cropping system should return large amounts of residue to the soil and should include deeply rooted plants such as grasses and legumes in rotation to help conserve moisture and improve soil productivity and tilth.

CAPABILITY UNIT IIc-1

Yahola fine sandy loam, the only soil in this unit, is fine sandy loam throughout. It is well drained and moderately rapidly permeable.

Small grain and sorghum are the principal crops. Careful management of the residue from these crops helps keep the soil in good tilth.

CAPABILITY UNIT IIc-2

This unit consists of nearly level soils on bottom lands. These soils have a surface layer that ranges from clay loam to silt loam in texture. They are seldom overflowed, but when they are flooded, the waters are slow moving and remain only a short time.

The soils are moderately to moderately slowly permeable. Cultivated crops are mainly small grain, sorghum, and cotton. Crops that produce large amounts of residue are needed to keep the soils in good tilth.

CAPABILITY UNIT IIc-3

The soils of this unit have a clay loam surface layer and are moderately slowly permeable. These nearly level soils are on upland plains. They have a high available water capacity and are well drained.

Grain sorghum, cotton, and small grains are the principal crops. Crops that produce large amounts of residue and deep rooted plants are desirable because they help to keep the soil in good tilth.

CAPABILITY UNIT IIc-4

Nuvalde clay loam, 0 to 1 percent slopes, the only soil in this unit, has a clay loam surface layer. This nearly level soil is on plains or stream terraces. It has a high available water capacity.

This soil is well suited to use as cropland. It is subject to a slight hazard of erosion. Small grain, grain sorghum, and other crops suited to the climate are grown.

CAPABILITY UNIT IIc-5

This unit consists of Lindy clay loam, 0 to 1 percent slopes. This soil has a clay loam surface layer and a clay lower layer and is subject to a slight hazard of erosion.

Small grains and sorghum are the principal crops grown. Crop residues should be kept on the surface to maintain or improve productivity and tilth.

CAPABILITY UNIT IIc-6

Winters fine sandy loam, 0 to 1 percent slopes, the only soil in this unit, is nearly level and has a fine sandy loam surface layer.

This soil is subject to a slight hazard of erosion. It is well suited to small grains and sorghum. Crop residues should be kept on the surface.

CAPABILITY UNIT IIIe-1

Pedernales loamy fine sand, 1 to 3 percent slopes, is the only soil in this unit. This gently sloping soil has a loamy fine sand surface layer that is subject to a moderate hazard of erosion. The soil will blow if cultivated and left bare during periods of strong winds.

A rotation that includes small grains, sorghum, and a legume such as vetch is suited to this soil. Growing plants or crop residue should be kept on the surface at all times to control soil blowing and water erosion. Fertilizers are needed to maintain or improve fertility.

CAPABILITY UNIT IIIe-2

Tobosa clay, 1 to 3 percent slopes, a clayey soil that cracks deeply when dry, is the only soil in this unit. It is on upland plains and in shallow valleys throughout most of the county.

This soil is very slowly permeable. The movement of water, air, and plant roots is hindered by the clayey texture of the soils. Water enters the soil readily through surface cracks caused by drying, but very slowly after the cracks close. The soil has a high available water capacity.

Cultivated crops are mainly small grains and sorghums. Some cotton is grown. A cropping system that includes small grains and sorghums, managed to keep a large amount of residue on the surface, is needed to conserve moisture and maintain soil productivity and tilth. Terraces and contour farming are needed to help reduce runoff and control erosion.

CAPABILITY UNIT IIIe-3

This unit is made up of clay loam and silty clay soils that are shallow and gently sloping. They have a low available water capacity and are subject to a moderate to high hazard of erosion.

These soils are suited to small grains, sorghum, and native and adapted grasses such as side-oats grama and blue panicgrass. Control of erosion is important on these soils because of their shallow depth. Use of close-growing crops that leave a large amount of residue, and use of grasses and legumes in rotation, helps control erosion. Diversion terraces and grassed waterways are needed in some places.

CAPABILITY UNIT IIIe-4

This unit consists of Krum clay loam, 3 to 5 percent slopes. This soil is gently sloping, has a clay loam surface layer, and is moderately slowly permeable. It is mainly at the base of steeper slopes, and careful management is needed to prevent gullying caused by runoff.

The soil is suited to small grains and sorghums. Cultivated areas need diversion terraces and grassed waterways in most places. Cropping systems that leave large amounts of residue on the surface are needed.

CAPABILITY UNIT IIIe-5

This unit consists of gently sloping, eroded soils that have a fine sandy loam surface layer. These soils are moderately to slowly permeable and are subject to a moderate to high hazard of erosion. The surface layer tends to crust after rain.

The soils are suited to small grain and sorghums and to native and adapted grasses and legumes. Crops that provide large amounts of residue are needed to help protect the soil from erosion and to improve tilth. Terraces and grassed waterways help control runoff and erosion. These soils respond well to fertilizer, which is needed to

improve fertility and increase the amount of residue returned to the soil.

Some areas of this unit are being retired from cultivation. Native and introduced grasses that are suitable for seeding require careful management to insure a good grass cover.

CAPABILITY UNIT IIIe-6

The soils of this unit have a fine sandy loam surface layer and slowly to moderately slowly permeable lower layers. These gently sloping soils are subject to a moderate hazard of erosion. If the surface is left bare and smooth, these soils will blow.

The soils of this unit are suited to small grain, sorghum, and cotton. Crops that return large amounts of residue to the soil help control erosion and maintain tilth. Fertilizers are needed to improve fertility. Terraces and grassed waterways help control runoff and erosion.

CAPABILITY UNIT IVe-1

Owens clay, 1 to 3 percent slopes, the only soil in this unit, is a shallow clay underlain by shaly clay. It is very slowly permeable. The available water capacity is low, and runoff is rapid.

The soil is best suited to grasses that are able to grow under droughty conditions. Winter growing crops, such as small grains, are suited. Careful management is needed to control runoff and erosion and to improve fertility and tilth. Crop residue from small grains, kept on the surface, improves fertility and tilth.

CAPABILITY UNIT IVe-2

This unit consists of Sarita loamy fine sand, 1 to 5 percent slopes. This soil is deep and has a loamy fine sand surface layer. It is subject to a high hazard of blowing. The available water capacity is low.

Although such crops as peanuts and melons can be grown with careful management, this soil is best suited to grasses.

Good management practices are needed to maintain and increase fertility and to prevent soil blowing. Fertilizer greatly increases production on the soil.

CAPABILITY UNIT IVs-1

This unit consists of Hilgrave gravelly loam, clayey variant, 1 to 3 percent slopes. This gently sloping soil has a gravelly loamy surface layer. The hazard of erosion is moderate, and permeability is moderately rapid. The available water capacity is moderate.

The soil is best suited to grasses. Where cultivated, special care is needed to provide a cover of growing plants or a litter of residue to protect the soil from erosion.

CAPABILITY UNIT Vw-1

The nearly level soils of this unit have clay loam and silt loam surface layers. They are on the flood plains of streams. Areas of this unit that are not protected from flooding are best suited to range or wildlife habitat. Areas protected from flooding are suited to small grains, sorghums, and cotton.

CAPABILITY UNIT VIe-1

The fine sandy loam and silt loam soils of this unit are on steps and narrow benches along deeply entrenched river channels. Ridgetops and narrow, low-lying, frequently flooded benches make up part of the unit. Overfall gullies are a problem of erosion control in many places.

The soils of this unit are best suited to range or wildlife. A cover of grasses helps control erosion. Shaping and seeding critical areas to native or adapted grasses and diverting water from gullied areas help to stabilize these areas.

CAPABILITY UNIT VIe-2

The very shallow to deep soils of this unit have a fine sandy loam to clay loam surface layer. They are subject to a moderate to high hazard of erosion, and runoff is moderate to rapid.

The soils of this unit are not suited to cultivated crops but are best suited to grasses.

CAPABILITY UNIT VIe-3

This unit consists of moderately deep to very shallow soils that have a fine sandy loam to clay surface layer. These soils have a low to high available water capacity, and they are subject to a moderate to high hazard of erosion.

These soils are not suited to cultivated crops. They are best suited to grasses, and a good cover of grass is needed to control erosion.

CAPABILITY UNIT VIIs-1

This unit is made up of loamy and clayey soils and land types that are gravelly or stony. These soils are strongly sloping to moderately steep. They are subject to a high hazard of erosion and are low in fertility. The available water capacity is low.

Although these soils are best suited to grasses, careful management is needed to maintain enough grass to control runoff and erosion.

CAPABILITY UNIT VIIIs-1

This unit consists of gently sloping to steep Badlands. Severely eroded areas of shales and clay and a few outcropping layers of limestone or sandstone are typical of the unit.

Badlands support little vegetation and are best suited to wildlife. Some selected areas are suitable for ponds.

Predicted yields

Table 2 lists the soils of Coleman County that are used for cultivation and gives predicted average yields per acre for oats, wheat, grain sorghum, and cotton grown under a high level of dryland management. Soils that are not suitable for cultivation are not included in the table.

This dryland management required to obtain the yields in table 2 is based on—

1. Planting of crop varieties adapted to the area.
2. Proper seeding rates, optimum planting dates, and efficient harvesting methods.
3. Timely control of weeds, insects, and diseases to obtain normal plant growth.
4. Applying fertilizer when it is necessary to establish legumes.
5. Growing cover crops where appropriate.
6. Constructing terraces and practicing contour farming where appropriate.

TABLE 2.—*Predicted average yields per acre of principal crops*

[Absence of figure indicates that the crop is not commonly grown on the soil]

Soil	Oats	Wheat	Grain sorghum	Cotton
	Bu.	*Bu.*	*Lb.*	*Lb. of lint*
Abilene clay loam, 0 to 1 percent slopes	45	25	3, 000	350
Abilene clay loam, 1 to 3 percent slopes	40	20	3, 000	325
Bonti fine sandy loam, 1 to 3 percent slopes	40	17	2, 500	225
Callahan loam, 1 to 3 percent slopes	40	20	3, 000	325
Callahan clay loam, 1 to 3 percent slopes	43	20	3, 500	350
Clairemont silt loam	45	25	3, 750	350
Frio clay loam	45	25	3, 500	400
Hilgrave gravelly loam, clayey variant, 1 to 3 percent slopes	20	13	1, 100	140
Kavett silty clay, 1 to 3 percent slopes	30	15	2, 500	250
Krum clay loam, 1 to 3 percent slopes	50	25	4, 000	350
Krum clay loam, 3 to 5 percent slopes	30	20	3, 000	275
Lindy clay loam, 0 to 1 percent slopes	45	22	3, 500	350
Lindy clay loam, 1 to 3 percent slopes	40	20	3, 000	300
Menard fine sandy loam, 1 to 3 percent slopes	40	20	3, 250	325
Menard fine sandy loam, 1 to 5 percent slopes, eroded	30	18	3, 000	275
Mereta clay loam, 1 to 3 percent slopes	30	16	2, 500	250
Miles fine sandy loam, 1 to 3 percent slopes	40	20	3, 000	350
Nuvalde clay loam, 0 to 1 percent slopes	45	22	3, 250	325
Nuvalde clay loam, 1 to 3 percent slopes	42	20	3, 000	300
Olton clay loam, 0 to 1 percent slopes	45	22	3, 250	325
Olton clay loam, 1 to 3 percent slopes	40	20	3, 000	300
Owens clay, 1 to 3 percent slopes	20	12		
Pedernales loamy fine sand, 1 to 3 percent slopes	25	14	2, 250	225
Pedernales fine sandy loam, 1 to 3 percent slopes	30	17	3, 000	250
Pedernales fine sandy loam, 1 to 3 percent slopes, eroded	25	14	2, 500	225
Rowena clay loam, 0 to 1 percent slopes	45	22	3, 250	325
Rowena clay loam, 1 to 3 percent slopes	42	20	3, 000	300
Speck clay loam, 1 to 3 percent slopes	30	16	2, 500	225
Tobosa clay, 0 to 1 percent slopes	35	22	3, 250	325
Tobosa clay, 1 to 3 percent slopes	30	20	3, 000	300
Valera clay, 1 to 3 percent slopes	45	22	3, 500	350
Weymouth loam, 1 to 3 percent slopes	30	20	3, 000	300
Winters fine sandy loam, 0 to 1 percent slopes	40	22	3, 250	325
Winters fine sandy loam, 1 to 3 percent slopes	30	20	3, 000	300
Yahola fine sandy loam	42	20	3, 250	350

7. Managing crop residue to help control erosion, to increase water infiltration, and to enhance seedling emergence.
8. Applying fertilizer according to results of soil tests and needs of the crop grown.

Use of the Soils for Range [2]

Production of livestock is the major source of farm income in Coleman County. In 1969, there were 1,073 farms and ranches in the county, almost all of which reported livestock, dominantly cattle. In that year, 892 farms and ranches reported cattle and calves, and 364 reported sheep and lambs.

About 62 percent of the county is used for the production of native vegetation, which, in turn, is grazed by domestic livestock, deer, and other wildlife. The soils produce a mixture of plants suitable for grazing by cattle, sheep, and goats. Most of the forage is produced on rangeland, but a majority of the ranches use some of their soils for the production of cultivated forage and grain crops for grazing or hay.

The combination of soils and climate is one that can produce a mixed stand of prairie grasses. In the stand are short and medium height grasses and scattered areas of tall grasses. The stony soils and sandy loams are suited to the growth of several kinds of oak, grasses, and forbs. The very shallow soils now support mainly grass and a few woody plants. Mesquite and other brush have invaded the grasslands on both shallow and deep soils. Brush dominates except where it is controlled.

Growth of native vegetation is greatest during April, May, and June, when rainfall and temperatures are favorable. Another period of growth usually occurs during September and October.

The forage produced on the range is marketed through the sale of livestock and wool. Successful stockmen keep the soils productive of good forage plants. They accomplish this mainly through control of grazing and related good practices of range management.

Range sites and condition classes

The soils of Coleman County have been placed in range sites to aid ranches in managing their range.

A range site is a group of soils significantly different from other groups of soils in its ability to produce native vegetation. Significant differences are those great enough to require some variation in management, such as a different rate of stocking. The soils in a given range site produce about the same kind and amount of climax vege-

[2] By R. J. PEDERSON, range conservationist, Soil Conservation Service.

tation. Differences in the kinds, proportions, and production of plants that different range sites are capable of supporting are the result of differences in soil, topography, climate, and similar factors in the environment.

Climax vegetation is the potential plant community on a particular range site. This vegetation is capable of reproducing itself and does not greatly change so long as the environment remains unchanged. Throughout most of this county, the climax vegetation consists of those kinds of plants that were growing there when the region was first settled. Generally this is the most productive combination of native grasses, forbs, and woody plants the range site can support.

The plant community changes under continuous heavy grazing. The change varies, depending on the kind of livestock on the range. In this survey, grazing is assumed to be that done by sheep and cattle.

Grazing animals repeatedly crop the palatable plants in preference to others in the stand. Under this repeated cropping, the plants lose vigor, develop smaller root systems, and produce fewer seeds. If the close grazing continues, some die out and the relative amount of palatable plants decreases. These palatable climax plants therefore are called *decreasers*. When a decreaser plant is killed by too much grazing, its place is taken by less palatable or shorter plants, called *increasers*.

When most of the decreasers are gone, animals graze the increaser plants. If heavy grazing continues, the increasers lose vigor and reproduction is slowed or stopped. Then, plants from another community fill the interspaces. These plants are called *invaders*. They are plants of low value for grazing that are capable of increasing under excessive grazing or other adverse conditions.

Range condition is a classification used to provide an approximate measure of the deterioration or improvement of range under grazing. The condition is based on a comparison of the present plant growth on a site with the climax vegetation the site can support.

Four range condition classes are used to indicate the degree of departure from the potential, or climax, vegetation that has been brought about by grazing or other use.

On range in *excellent condition*, 76 to 100 percent of the present vegetation is of the same kind as the climax vegetation. Range is in *good condition* if this percentage is between 51 and 75, in *fair condition* if the percentage is between 26 and 50, and in *poor condition* if the percentage is 25 or less. Most of the range in this county is in fair condition and contains a considerable amount of brush (fig. 11).

One of the main objectives of good range management is to keep range in excellent or good condition. If this is done, water is conserved, yields are improved, and the soils are protected. The problem is in recognizing important changes in the kind of cover on a range site. Changes usually take place gradually, and they can be

Figure 11.—**Deep Upland range site in fair condition. (Rowena clay loam, 0 to 1 percent slopes.)**

misunderstood or overlooked. Growth encouraged by heavy rainfall may lead to the conclusion that the range is in good condition, when actually the cover is weedy and the long-range trend is towards lower production. On the other hand, dry range that has been closely grazed for relatively short periods can have a degraded appearance that temporarily conceals its true quality and ability to recover.

Local representatives of the Soil Conservation Service can help determine condition of range and suggest management that maintains or improves the range.

Descriptions of the range sites

The following descriptions of range sites contain information about the kinds of plants natural for the soils of the site, the approximate yield, and other characteristics of the range site. Some mapping units consist of two soils that belong to different range sites. An example is Tarrant and Purves soils, undulating. The Tarrant part of this mapping unit is in the Low Stony Hills range site, and the Purves part is in the Shallow range site. To determine the range site of a given soil, refer to the "Guide to Mapping Units," which is at the back of this survey, just ahead of the soil maps.

BOTTOMLAND RANGE SITE

The soils of this site are deep clay loams, silty clay loams, silt loams, and fine sandy loams along streams. These soils receive extra moisture as occasional overflows or as runoff from adjacent higher areas. They have high available water capacity.

The potential plant community varies somewhat, in relation to the amount of extra water received. The most productive areas are adjacent to the streams, where grasses such as switchgrass, indiangrass, and little bluestem grow.

The original, or potential, plant community is made up of such decreasers as side-oats grama, cane and silver bluestem, Arizona cottontop, Canada wildrye, and Engelmann daisy. Increasers are vine-mesquite, white tridens, meadow dropseed, buffalograss, plains bristlegrass, and Texas wintergrass. Plants that commonly invade the site are annual weeds and grasses such as rescuegrass, three-awn, tumble windmillgrass, western ragweed, and mesquite, lotebush, cactus, and other woody plants. Buffalograss and Texas wintergrass tend to dominate where the site is heavily grazed. Some elm, hackberry, willow, and pecan trees are native to the site.

Livestock prefer to graze the bottom lands. Heavy grazing in these areas has resulted in the loss of the original plant cover. Forage production can be improved by brush control and deferred grazing. Reseeding of the original plants is best accomplished after brush has been controlled by bulldozing or rootplowing.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 5,000 pounds in wet years to 2,500 pounds in dry years.

DEEP UPLAND RANGE SITE

The soils of this range site are deep clays, loams, and clay loams on nearly level to gently sloping uplands. The available water capacity is high to moderate.

The original, or potential, plant community is an open grassland prairie. The first plants to decrease under heavy, continuous use are side-oats grama, Canada wildrye, and cane or silver bluestem. Plants that at first increase are buffalograss, Texas wintergrass, and vine-mesquite. Plants that invade the site are red grama, Texas grama, three-awn, mesquite, ragweed, and annuals. Mesquite invades readily on the deep soil and is now abundant. Live oak, hackberry, pecan, and elm grow along creeks in most areas.

Forage production can be improved primarily by limiting the duration and number of animals grazing a site. This helps keep forage plants healthy and productive. Mesquite can be controlled by either mechanical or chemical methods. Reseeding is successful if a good seedbed is prepared. This site is used by deer and turkey.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 4,500 pounds in wet years to 2,000 pounds in dry years.

REDLAND RANGE SITE

The soils of this site are clay loams that have rock fragments on the surface in most places. The stones on and in the soil increase the effectiveness of small rains and aid in reducing evaporation and runoff. The available water capacity is low. Cracks in underlying rock permit plant roots and moisture to penetrate to greater depths.

The potential plant community is a mixture of grasses and scattered live oak and post oak. The decreaser grasses are little bluestem and indiangrass. Plants that increase are side-oats grama, Texas wintergrass, buffalograss, live oak, and some forbs. Plants that commonly invade are three-awn, Texas grama, annuals, mesquite, and pricklypear.

The site is improved and productivity is maintained primarily by grazing management. Thinning the oak and controlling the mesquite is beneficial.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 3,800 pounds in wet years to 1,800 pounds in dry years.

SANDY LOAM RANGE SITE

This site is made up of deep and moderately deep fine sandy loams that are moderately to moderately slowly permeable. The available water capacity is high.

The potential plant community is a grass and interspersed oaks. Post oak and other oaks make up about 25 percent of the vegetation. Decreaser grasses are little bluestem, indiangrass, sand lovegrass, purpletop, and Canada wildrye. Increasers are side-oats grama, Texas wintergrass, buffalograss, silver bluestem, hairy grama, and hooded windmillgrass. Post oak often increases.

Invaders are sand dropseed, low-growing lovegrasses, three-awn, and numerous annual weeds and grasses. Mesquite invades to some degree, especially after oak is controlled. Other woody invaders are tasajillo, catclaw acacia, yucca, and pricklypear.

Range seeding can be accomplished on this site, and thinning or full reduction of the oak improves the yield of grass forage.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 3,800 pounds in wet years to 1,700 pounds in dry years.

RIVER BREAKS RANGE SITE

This site, a nearly continuous strip averaging about 500 feet wide along the Colorado River, is made up of only Yahola and Clairemont soils, strongly sloping. It consists mainly of steps and narrow, gently sloping benches along the deeply entrenched river channel. These soils are also on ridgetops, however, where they are isolated by deep stream channels and steps. Overfall gullies are a problem in erosion control in many places. The nearly level areas in this site are more productive than the steeper ones. The nearly level areas receive extra moisture, either as occasional overflow flooding or as runoff from adjacent higher land.

The potential plant community varies in relation to differences in moisture supply and slope. Some small areas near the river channel support a few trees, such as pecan, elm, and hackberry. Switchgrass, indiangrass, little bluestem, and Canada wildrye are common decreasers on this site. Increasers make up about 20 percent of the plant cover. Among these increasers are side-oats grama, hairy dropseed, vine-mesquite, and Texas wintergrass.

Invading plants on this River Breaks site are three-awns, grassbur, buffalograss, sand dropseed, tumble windmillgrass, western ragweed, and nightshades. The main woody invaders are mesquite and whitebrush. Bermudagrass invades and dominates in some small areas near the river.

Control of brush and reseeding can increase the production of deteriorated areas of this site.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 3,500 pounds in wet years to 1,500 pounds in dry years.

TIGHT SANDY LOAM RANGE SITE

This range site is made up of gravelly loams, fine sandy loams, or loamy fine sands that are underlain by clay and gravelly clay. These soils are droughty, and the available water capacity is moderate to high.

The potential plant community is made up of grasses and scattered stunted oak. Decreaser grasses are side-oats grama, vine-mesquite, cottontop, and some indiangrass. Increasers are buffalograss, hooded windmillgrass, and Texas wintergrass. Invader plants are mesquite, annual weeds, grasses, three-awn, red lovegrass, Halls panicum, and whitebrush.

Brush control is feasible on this site. Mechanical soil loosening, such as rootplowing or chiseling, can increase intake of water temporarily. Such practices, coupled with range seeding, can increase production and improve range condition. Light grazing that removes only about 40 percent of the annual growth permits deeper root growth.

Where this site is in excellent condition, the potential acre yield or air-dry herbage ranges from 3,400 pounds in wet years to 1,500 pounds in dry years.

DEEP SAND RANGE SITE

Sarita loamy fine sand, 1 to 5 percent slopes, is the only soil in this range site. This deep loamy fine sand has low available water capacity. Plants that grow best on this site are deeply rooted grasses, forbs, and trees.

The decreaser grasses in the potential plant community are little bluestem, indiangrass, switchgrass, purpletop, and sand lovegrass. Increasers are fall witchgrass, hairy grama, Wright three-awn, giant dropseed, and fringeleaf paspalum. Plants that invade with continued overgrazing are annuals such as grassbur, weeds, gummy lovegrass, red lovegrass, purple sandgrass, sand dropseed, and hooded windmillgrass. Mesquite especially invades on abandoned cropland. Bullnettle is common throughout the site.

Reseeding this soil is difficult because of the quickly drying surface layer. Crop residues should be used to prevent soil blowing and to prevent drying of the surface.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 3,000 pounds in wet years to 1,400 pounds in dry years.

SANDSTONE HILLS RANGE SITE

The soils of this site are moderately deep fine sandy loams. These soils have sandstone fragments on the surface and in the soil material, and they have high available water capacity.

The potential plant community is made up of grasses and forbs mixed with post oak and blackjack oak. Decreaser grasses are little bluestem, which predominates, indiangrass, and sand lovegrass. Increasers are side-oats grama, hairy grama, hairy and tall dropseed, and Arizona cottontop. Sagewort, lespedeza, sundrops, and bluebonnet are important forbs.

Invaders are three-awn, tumble windmillgrass, red grama, red lovegrass, and various annual weeds and grasses. Mesquite, whitebrush, and prickly ash also invade the site in some locations. The percentage of oak often gradually increases, and this reduces forage yield.

The soils of this site normally do not need reseeding. Controlled grazing, coupled with control of brush, gradually improves forage growth.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 2,700 pounds in wet years to 1,500 pounds or less in dry years. About one-fourth of this yield is twigs, oak leaves, and fruit that is mostly out of reach of grazing animals.

SHALLOW RANGE SITE

This site consists of moderately deep to shallow clay to loam soils on uplands. These soils are gently sloping to sloping, and they have a low to moderate available water capacity.

The potential plant community on this site consists of a mixture of short and medium height grasses, a few forbs, and an occasional live oak tree or mott. Side-oats grama, the dominant decreaser, makes up more than half of the yield where the site is in excellent condition. Other decreasers are little bluestem, cane bluestem, vine-mesquite, and green sprangletop. Continuous close grazing results in a decrease of side-oats grama and little bluestem and permits buffalograss, Texas wintergrass, fall witchgrass, slim tridens, and curly mesquite to increase. Further deterioration results in invasion by purple three-awn, Texas grama, red grama, annual weeds, mesquite, agarito, and pricklypear.

This site can be improved through use of the proper stocking rate and rotational grazing. Brush control and reseeding following seedbed preparation are effective on these soils.

Where the site is in excellent condition the potential acre yield of air-dry herbage ranges from 2,000 pounds in wet years to 1,000 pounds in dry years.

STEEP ADOBE RANGE SITE

The only soil in this site is the Somervell part of the Somervell-Stony land complex, moderately steep. This is a strongly sloping to moderately steep loamy soil that contains a large amount of calcium carbonate and has a gravelly or stony surface layer. The available water capacity is low.

The potential plant community is mainly grasses and woody vegetation such as Texas oak, live oak, and sumac. Decreaser grasses are little bluestem, tall grama, indiangrass, and side-oats grama. The main increasers are Wright three-awn, reverchon panicum, slim tridens, buffalograss, queensdelight, and the different kinds of oak. Invaders are annual forbs and grasses, croton, three-awn, Texas grama, and red grama.

The control of oak by bulldozing or chaining allows improvement in forage growth. Reseeding is seldom needed on this site.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 1,800 pounds in wet years to 800 pounds in dry years.

LOW STONY HILLS RANGE SITE

This site is made up of shallow to very shallow soils on uplands. These clayey soils are intermixed with stones, and rock fragments are scattered over their surface. The available water capacity is low, and runoff is rapid.

The potential plant community is a mixture of grasses and forbs, and about 10 percent is shin oak, live oak, sumac, and other browse plants. Pecan, hackberry, elm, and other trees grow along some creek banks. The decreaser grasses are little bluestem, side-oats grama, green sprangletop, indiangrass, and big bluestem. Increasers are Texas wintergrass, hairy grama, slim tridens, live oak, shin oak, and orange zexmenia. Common invaders are mealycup sage, pricklypear, red grama, and annual weeds and grasses.

Controlled grazing is the primary method of maintaining or improving the vegetation on this range site. Mechanical uprooting or chemicals can be used to control selectively thick stands of oak.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 1,700 pounds in wet years to 1,200 pounds in dry years.

ROCKY HILLS RANGE SITE

This site consists of a mixture of rock fragments and gravelly and cobbly clay that is underlain by shales and soft limestone. The site is strongly sloping to moderately steep, and the surface is covered with rock fragments (fig. 12).

The potential plant community is tall to mid grasses. The plant community is about 70 percent decreasers such as little bluestem, indiangrass, switchgrass, and Canada

***Figure 12.*—Rocky Hills range site. Mesquite, tasajillo, and annual weeds have invaded this area. (Stony land part of Stony land and Owens soils, moderately steep.)**

wildrye. Increasers are silver and cane bluestem, side-oats grama, buffalograss, hairy dropseed, and rough tridens. Invaders are red grama, hairy tridens, three-awn, western ragweed, mesquite, catclaw acacia, and pricklypear.

Chaining and use of chemicals are effective in controlling brush. Range seeding is seldom practical on this site. A good plant cover is needed to control erosion and conserve water.

Where this site is in excellent condition, potential acre yield of air-dry herbage ranges from 1,500 pounds in wet years to 1,000 pounds in dry years.

VERY SHALLOW RANGE SITE

The soils of this site have very shallow surface layers that overlie strongly cemented caliche or hard limestone. Their available water capacity is low.

The potential plant community is open grassland consisting of mid and short grasses. The dominant grass is side-oats grama. Other decreasers are indiangrass, little bluestem, hairy dropseed, feather bluestem, slim tridens, and forbs such as bushsunflower, gayfeather, vine ephedra, and sagewort. Increasers are Wright and purple three-awn, buffalograss, curly mesquite, fall witchgrass, and hairy grama. Invaders are hairy tridens, red grama, annual weeds, croton, yucca, and pricklypear. Mesquite, condalia, and agarito invade to a lesser extent.

On parts of this site reseeding can be done successfully, but with difficulty. The seedbed can be prepared by chisel-type equipment. In most areas controlled grazing causes gradual improvement without reseeding.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 1,300 pounds in wet years to 700 pounds in dry years.

SHALY HILLS RANGE SITE

This site consists of shallow, clayey soils that are gently sloping to moderately steep. The available water capacity is low, and the hazard of erosion is high.

The kinds of plants suited to this site are those associated with dry clay soils. The potential plant community is mainly mid grass such as side-oats grama, and short grasses such as buffalograss and curly mesquite. Decreaser grasses are side-oats grama, Arizona cottontop, and cane bluestem. Curly mesquite and buffalograss are increasers that make up as much as 40 percent of the plant community. Plants that commonly invade the site are shrub mesquite, Texas grama, hairy tridens, tasajillo, and whitebrush.

Opportunities for seedbed preparation are limited because of slopes and the hazard of erosion. Brush control and controlled grazing help maintain or improve the plant cover on this site.

Where this site is in excellent condition, the potential acre yield of air-dry herbage ranges from 1,200 pounds in wet years to 700 pounds in dry years.

Engineering Uses of the Soils [3]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreation areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soil for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 3, 4, and 5, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 3 and 4, and it also can be used to make other useful maps.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 5 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have a special meaning to soil scientists that is not known to all engineers. The Glossary at the back of this survey defines many of these terms commonly used in soil science.

Engineering classification systems

Agricultural scientists of the U.S. Department of Agriculture (USDA) classify soils according to texture, color, and structure. This system is useful as the initial step in making engineering classifications of soils. Additional properties important in engineering can be estimated or can be determined by tests.

[3] By ROBERT W. ROTHE, civil engineer, Soil Conservation Service.

TABLE 3.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in for referring to other series that appear in the first column of this

Soil series and map symbols	Hydrologic group	Depth to bedrock	Depth from surface	Classification: USDA texture
		Inches	*Inches*	
Abilene: AbA, AbB	C	>60	0–11	Clay loam
			11–40	Clay
			40–80	Clay loam
Badland: BA. Properties too variable to estimate.				
*Bonti: BoB, BNB, BWB. For Owens part of BWB, see Owens series.	C	20–40	0–8	Fine sandy loam
			8–34	Clay loam
			34–42	Weakly cemented sandstone.
Callahan: CaB, CcB	C	>60	0–7	Loam
			7–36	Clay
			36–70	Silty clay loam
Clairemont: Cm	B	>60	0–66	Silt loam
Clairemont, clayey variant: Cn	C	>60	0–7	Silty clay loam
			7–16	Silty clay
			16–60	Clay
Frio: Fo, Fr	B	>60	0–60	Clay loam
Hilgrave, clayey variant: HgB	B	20–50	0–8	Gravelly loam
			8–16	Very gravelly clay
			16–50	Gravelly clay loam
			50–64	Shaly clay.
*Kavett: KvB, KAB. For Talpa part of KAB, see the Talpa series.	D	10–20	0–17	Silty clay
			17–23	Limestone fragments.
*Kimbrough: KMB. For Mereta part of KMB, see Mereta series.	C	4–10	0–6	Clay loam
			6–12	Strongly cemented caliche.
			12–55	Silt loam and loam
Krum: KwB, KwC	C	>60	0–80	Clay loam
Lindy: LdA, LdB	C	20–40	0–7	Clay loam
			7–24	Clay
			24–30	Cobbly clay
			30–32	Hard, fractured limestone.
*Menard: MeB, MeC2, MmC2. For Weymouth part of MmC2, see Weymouth series.	B	>60	0–6	Fine sandy loam
			6–42	Sandy clay loam
			42–64	Loam
			64–72	Very fine sandy loam
Mereta: MrB	C	>60	0–18	Clay loam
			18–22	Strongly cemented, fractured caliche.
			22–60	Silty clay loam
Miles: MsB	B	>60	0–6	Fine sandy loam
			6–84	Sandy clay loam
			84–96	Fine sandy loam
Nuvalde: NuA, NuB	C	>60	0–28	Clay loam
			28–60	Silty clay loam
Olton: OcA, OcB	C	>60	0–6	Clay loam
			6–46	Clay
			46–108	Clay loam

significant in engineering

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions table. Symbol > means more than; symbol < means less than]

Classification—Continued		Percentage passing sieve				Permea-bility	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
CL	A-6	100	100	95-99	75-95	0. 63-2. 00	0. 16-0. 18	6. 6-8. 4	Moderate.
CL	A-6 or A-7	100	100	95-99	90-95	0. 20-0. 63	0. 17-0. 19	7. 9-8. 4	Moderate.
CL	A-6	100	100	95-99	75-95	0. 20-0. 63	0. 16-0. 18	7. 9-8. 4	Moderate.
SM	A-2 or A-4	85-100	85-100	70-80	30-45	0. 63-2. 00	0. 12-0. 14	6. 1-7. 3	Low.
CL	A-6	100	100	90-100	70-80	0. 20-0. 63	0. 16-0. 18	5. 6-6. 0	Moderate.
ML	A-4	100	100	85-95	60-75	0. 63-2. 00	0. 13-0. 15	6. 6-8. 4	Low.
CL	A-7	100	100	90-100	75-95	0. 06-0. 20	0. 17-0. 19	6. 6-8. 4	Moderate.
CL	A-7	100	100	95-100	85-95	0. 06-0. 20	0. 16-0. 18	6. 6-8. 4	Moderate.
CL	A-6	100	100	100	85-98	0. 63-2. 00	0. 16-0. 19	7. 9-8. 4	Low.
CL	A-6	100	100	90-100	80-95	0. 06-0. 20	0. 15-0. 18	7. 9-8. 4	Moderate.
CL	A-6 or A-7	100	100	90-100	80-95	0. 06-0. 20	0. 15-0. 18	7. 9-8. 4	Moderate.
CL or CH	A-6 or A-7	100	100	90-100	80-95	0. 06-0. 20	0. 15-0. 18	7. 9-8. 4	Moderate.
CL	A-6	95-100	95-100	75-100	70-95	0. 20-0. 63	0. 16-0. 18	7. 9-8. 4	Moderate.
SC, SM, or CL	A-4	70-90	65-85	50-75	35-60	2. 00-6. 30	0. 13-0. 15	6. 6-8. 4	Low.
GC or GP-GC	A-1	30-40	20-30	15-25	5-15	0. 20-0. 63	0. 08-0. 10	6. 6-8. 4	Low.
GM	A-2	40-50	30-40	25-35	20-30	0. 63-2. 00	0. 08-0. 10	6. 6-8. 4	Low.
CH	A-7	90-100	90-100	85-100	80-95	0. 20-0. 63	0. 16-0. 18	7. 9-8. 4	High.
ML	A-4	95-100	95-100	80-95	60-75	0. 63-2. 00	0. 13-0. 15	7. 9-8. 4	Low.
GM, GC, SM, SC	A-2, A-4, A-6	30-80	25-75	20-60	12-50	0. 63-2. 00	0. 12-0. 14	7. 9-8. 4	Low.
CH	A-7	95-100	95-100	95-100	85-95	0. 20-0. 63	0. 16-0. 18	7. 9-8. 4	High.
CL	A-6, A-7	95-100	95-100	90-100	70-85	0. 06-0. 20	0. 16-0. 18	7. 4-8. 4	Moderate.
CH or CL	A-6, A-7	95-100	95-100	90-100	75-95	0. 06-0. 20	0. 17-0. 19	7. 4-8. 4	Moderate.
GC	A-1	15-25	15-25	10-20	5-15	0. 06-0. 20	0. 04-0. 06	7. 4-8. 4	Low.
SM-SC	A-4	100	100	85-95	40-50	2. 00-6. 30	0. 11-0. 13	7. 4-7. 8	Low.
SC or CL	A-6	100	100	80-90	35-55	0. 63-2. 00	0. 16-0. 18	7. 4-8. 4	Low.
CL	A-6	100	100	85-95	60-75	0. 63-2. 00	0. 13-0. 15	7. 9-8. 4	Low.
ML-CL	A-4	100	100	85-95	50-65	0. 63-2. 00	0. 09-0. 11	7. 9-8. 4	Low.
CL	A-6	95-100	90-100	80-90	70-80	0. 06-0. 20	0. 16-0. 18	7. 9-8. 4	Moderate.
CL	A-6	90-100	90-100	80-90	70-80	0. 06-0. 20	0. 10-0. 15	7. 9-8. 4	Low.
SM	A-2, A-4	100	100	80-95	25-50	2. 00-6. 30	0. 10-0. 13	7. 4-7. 8	Low.
CL, SC	A-6	100	100	90-97	45-60	0. 63-2. 00	0. 13-0. 15	6. 6-8. 4	Low.
SM	A-4, A-6	100	100	80-95	35-50	0. 63-2. 00	0. 11-0. 13	7. 9-8. 4	Low.
CL	A-6	95-100	95-100	90-100	60-90	0. 63-2. 00	0. 16-0. 18	7. 9-8. 4	Moderate.
CL	A-6	75-95	65-95	60-90	50-75	0. 63-2. 00	0. 10-0. 14	7. 9-8. 4	Moderate.
CL	A-6	95-100	95-100	90-100	70-80	0. 63-2. 00	0. 16-0. 18	7. 4-7. 8	Low.
CL	A-6, A-7	95-100	95-100	88-96	64-80	0. 20-0. 63	0. 17-0. 19	7. 4-8. 4	Moderate.
CL	A-6, A-7	95-100	91-100	88-96	60-76	0. 20-0. 63	0. 12-0. 14	7. 9-8. 4	Low.

TABLE 3.—*Estimated soil properties*

Soil series and map symbols	Hydrologic group	Depth to bedrock	Depth from surface	Classification: USDA texture
		Inches	*Inches*	
Owens: OwB	D	12–20	0–18	Clay
			18–36	Shaly clay
Pedernales: PdB, PeB, PeB2	C	>60	0–8	Fine sandy loam, loamy fine sand.
			8–28	Clay
			28–46	Clay loam
			46–54	Loam
Portales: Mapped only in complex with Weymouth series.	B	>60	0–10	Loam
			10–23	Clay loam
			23–60	Loam
*Purves: POB For Owens part of POB, see Owens series.	D	10–20	0–9	Clay loam
			9–18	Clay
			18–22	Hard limestone.
Rowena: RwA, RwB	D	>60	0–6	Clay loam
			6–30	Clay
			30–94	Clay loam and clay
Sarita: SaC	A	>60	0–48	Loamy fine sand
			48–72	Sandy clay loam
*Somervell: SoE For Stony land part of SoE, see Stony land.	B	20–40	0–22	Cobbly loam
			22–26	Limestone.
*Speck: SpB, SRB For Tarrant part of SRB, see Tarrant series.	D	14–20	0–8	Clay loam
			8–18	Clay
			18–22	Hard limestone.
*Stony land: STE Properties too variable to estimate. For Owens part of STE, see Owens series.				
Talpa Mapped only in undifferentiated unit with Kavett series.	D	6–20	0–8	Clay loam
			8–10	Hard limestone.
*Tarrant: TAB, TPB For Purves part of TPB, see Purves series.	D	6–20	0–14	Clay
			14–16	Fractured limestone.
Tobosa: ToA, ToB	D	>60	0–50	Clay
			50–72	Silty clay
Valera: VcB	C	20–40	0–28	Clay
			28–35	Silty clay loam
			35–58	Limestone fragments.
*Weymouth: WeB, WpB, WMB For Portales part of WpB, see Portales series; for Menard part of WMB, see Menard series.	B	20–40	0–32	Loam
			32–54	Weakly cemented sandstone.
Winters: WtA, WtB	C	>60	0–6	Fine sandy loam
			6–9	Clay loam
			9–32	Clay
			32–62	Clay loam
*Yahola: Ya, YCD For Clairemont part of YCD, see Clairemont series.	B	>60	0–60	Fine sandy loam

significant in engineering—Continued

Classification—Continued		Percentage passing sieve				Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
CH	A-7	95-100	95-100	90-100	80-95	<0. 06	0. 16-0. 18	7. 9-8. 4	High.
CH	A-7	90-100	85-100	70-90	55-80	<0. 06	0. 03-0. 08	7. 9-8. 4	High.
SM	A-2, A-4	100	100	70-85	25-50	0. 63-2. 00	0. 11-0. 13	7. 4-7. 8	Low.
CH	A-7	100	100	90-100	75-95	0. 06-0. 20	0. 17-0. 19	5. 6-6. 0	Moderate.
CL	A-6	100	100	90-100	70-80	0. 20-0. 63	0. 16-0. 18	6. 1-8. 4	Low.
ML	A-4	100	100	85-95	60-75	0. 20-0. 63	0. 13-0. 15	7. 9-8. 4	Low.
ML	A-4	100	100	85-95	60-75	0. 63-2. 00	0. 13-0. 15	7. 9-8. 4	Low.
CL	A-6	100	100	90-100	70-80	0. 63-2. 00	0. 14-0. 16	7. 9-8. 4	Low.
ML	A-4	100	100	85-95	60-75	0. 63-2. 00	0. 12-0. 14	7. 9-8. 4	Low.
CH	A-7	90-100	80-100	80-95	70-80	0. 63-2. 00	0. 16-0. 18	7. 9-8. 4	Moderate.
CH, SC	A-7	60-70	60-70	55-60	45-55	0. 20-0. 63	0. 17-0. 19	7. 9-8. 4	High.
CL, CH	A-6, A-7	98-100	95-100	90-100	70-80	0. 20-0. 63	0. 16-0. 18	7. 9-8. 4	Moderate.
CH or CL	A-6, A-7	95-100	85-100	70-100	65-95	0. 20-0. 63	0. 17-0. 19	7. 9-8. 4	High.
CL, CH	A-6, A-7	95-100	85-100	70-100	65-85	0. 20-0. 63	0. 16-0. 18	7. 9-8. 4	Moderate.
SM	A-2	100	100	65-80	20-35	6. 30-20. 0	0. 07-0. 08	7. 4-7. 8	Low.
SC	A-2, A-6	100	100	80-90	30-50	0. 63-2. 00	0. 12-0. 14	7. 4-7. 8	Low.
GM or SM	A-2 or A-7	30-75	20-65	15-50	10-40	0. 63-2. 00	0. 08-0. 10	7. 9-8. 4	Low.
CL	A-6	90-100	90-100	80-95	70-80	0. 20-0. 63	0. 16-0. 18	6. 1-7. 8	Low.
CL	A-7	75-95	75-95	75-95	75-95	0. 06-0. 20	0. 17-0. 19	6. 1-7. 8	Moderate.
CL	A-6	75-95	70-95	70-85	70-80	0. 63-2. 00	0. 12-0. 16	7. 9-8. 4	Moderate.
CH or MH	A-7	80-100	80-100	70-95	70-95	0. 06-0. 20	0. 15-0. 20	7. 9-8. 4	High.
CL, CH	A-6, A-7	98-100	90-100	85-100	70-95	<0. 06	0. 15-0. 20	7. 9-8. 4	High.
CH or CL	A-6 or A-7	95-100	90-100	85-100	70-95	<0. 06	0. 10-0. 15	7. 9-8. 4	High.
CH	A-6, A-7	95-100	95-100	85-95	80-90	0. 20-0. 63	0. 16-0. 18	7. 9-8. 4	High.
CH, GC	A-6, A-7	63-100	55-100	49-95	43-90	0. 20-0. 63	0. 16-0. 18	7. 9-8. 4	High.
ML	A-4	100	100	85-95	60-75	0. 63-2. 00	0. 13-0. 15	7. 9-8. 4	Low.
SM	A-4	100	100	70-85	40-50	0. 63-2. 00	0. 12-0. 14	6. 6-7. 3	Low.
CL	A-7	100	100	90-100	70-80	0. 20-0. 63	0. 17-0. 19	7. 4-7. 8	Moderate.
CL	A-7	100	100	90-100	75-95	0. 20-0. 63	0. 18-0. 20	7. 4-8. 4	Moderate.
CL	A-6	100	100	90-100	70-80	0. 20-0. 63	0. 16-0. 18	7. 9-8. 4	Moderate.
SM or ML	A-4	100	100	70-85	40-55	2. 0-6. 30	0. 13-0. 15	7. 9-8. 4	Low.

TABLE 4.—*Engineering interpretations*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils for referring to other series that appear in the first column of this table. Absence of entry

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir area
Abilene: AbA, AbB.	Fair: clay loam surface layer.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Severe: moderately slow permeability.	None to slight.	Moderate: moderately slow permeability.
Badland: BA. Properties too variable to rate.							
*Bonti: BoB, BNB, BWB. For Owens part of BWB, see Owens series.	Poor where 4 to 6 inches of fine sandy loam; fair where 6 to 10 inches of fine sandy loam.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Severe where 20 to 36 inches deep to bedrock; moderate where 36 to 40 inches deep to bedrock; fair traffic-supporting capacity; moderate shrink-swell potential.	Severe where 20 to 40 inches deep to bedrock and slopes are 6 to 8 percent; moderate where slopes are 1 to 6 percent; moderate shrink-swell potential.	Severe: moderately slow permeability.	Severe where 20 to 40 inches deep to bedrock.	Severe where 20 to 36 inches deep to bedrock; moderate where 36 to 40 inches deep to bedrock; moderately slow permeability.
Callahan: CaB, CcB.	Poor where 4 to 6 inches of loam; fair where 6 to 10 inches of loam.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Severe: slow permeability.	None to slight.	None to slight.
Clairemont: Cm.	Good	Fair: fair traffic-supporting capacity.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Moderate: moderate permeability.	Moderate: moderate permeability.
Clairemont, clayey variant: Cn.	Fair: silty clay loam surface layer.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Severe: flood hazard.	Severe: flood hazard.	Severe: slow permeability; flood hazard.	None to slight.	None to slight.
Frio: Fo	Fair: clay loam surface layer.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Severe: flood hazard.	Severe: moderately slow permeability.	None to slight.	Moderate: moderately slow permeability.

of soil properties

in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instruction
.in a column indicates that characteristics are too variable for the material to be classified]

Degree of limitations and soil features affecting—Continued					Soil features affecting—		Corrosivity for uncoated steel and contributing soil features
Farm ponds—Continued	Recreation				Terraces and diversions	Waterways	
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails			
Moderate: fair resistance to piping and erosion.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer; moderately slow permeability.	Moderate: clay loam surface layer.	Features generally favorable.	Features generally favorable.	High: clay texture; conductivity.
Moderate: medium compressibility.	None to slight.	None to slight.	Moderate where 20 to 40 inches deep to bedrock and slopes are 1 to 6 percent; severe where slopes are 6 to 8 percent.	None to slight.	Slopes and some stony areas.	Slopes and some stony areas.	Moderate: clay loam texture.
Moderate: medium compressibility.	None to slight.	None to slight.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 3 percent.	None to slight.	Features generally favorable.	Features generally favorable.	High: silty clay loam texture.
Moderate: fair resistance to piping and erosion.	Severe: flood hazard.	Moderate: flood hazard.	Severe: flood hazard.	None to slight.	Flooding-----	Flooding-----	Low.
Moderate: fair slope stability.	Moderate: silty clay loam surface layer; flood hazard.	Moderate: silty clay loam surface layer.	Severe: flood hazard.	Moderate: silty clay loam surface layer.	Flooding-----	Flooding-----	High: conductivity.
Moderate: medium compressibility.	Moderate: clay loam surface layer; moderately slow permeability.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Features generally favorable.	Features generally favorable.	High: conductivity.

TABLE 4.—*Engineering interpretations*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir area
Frio—Continued Fr	Fair: clay loam surface layer.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	None to slight.	Moderate: moderately slow permeability.
Hilgrave, clayey variant: HgB.	Poor: 15 to 35 percent gravel.	Poor where 20 to 24 inches of material; fair where 24 to 50 inches of material; fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	None to slight.	Moderate: moderate permeability below a depth of 16 inches.	Moderate: moderate permeability below a depth of 16 inches.	Moderate: moderately slow permeability.
*Kavett: KvB, KAB. For Talpa part of KAB, see Talpa series.	Poor: silty clay surface layer.	Poor: high shrink-swell potential; 10 to 20 inches deep to bedrock.	Severe: high shrink-swell potential; 10 to 20 inches deep to bedrock.	Severe: high shrink-swell potential; 10 to 20 inches deep to bedrock.	Severe: 10 to 20 inches deep to bedrock.	Severe: 10 to 20 inches deep to bedrock.	Severe: 10 to 20 inches deep to bedrock.
*Kimbrough: KMB. For Mereta part of KMB, see Mereta series.	Poor where 4 to 6 inches of loam; fair where 6 to 10 inches of loam.	Poor: strongly cemented caliche at depth of 4 to 10 inches.	Severe: strongly cemented caliche at depth of 4 to 10 inches.	Severe: strongly cemented caliche at depth of 4 to 10 inches.	Severe: strongly cemented caliche at depth of 4 to 10 inches.	Severe: strongly cemented caliche at depth of 4 to 10 inches.	Severe: strongly cemented caliche at depth of 4 to 10 inches.
Krum: KwB, KwC.	Fair: clay loam surface layer.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: moderately slow permeability.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 3 to 5 percent.	Moderate: moderately slow permeability.
Lindy: LdA, LdB.	Fair: clay loam surface layer.	Poor: poor traffic-supporting capacity.	Severe: poor traffic-supporting capacity.	Moderate: moderate shrink-swell potential.	Severe: slow permeability.	Severe: 20 to 40 inches deep to bedrock.	Severe where 20 to 36 inches deep to bedrock; moderate where 36 to 40 inches deep to bedrock.

of soil properties—Continued

Degree of limitations and soil features affecting—Continued					Soil features affecting—		Corrosivity for uncoated steel and contributing soil features
Farm ponds—Continued	Recreation						
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Terraces and diversions	Waterways	
Moderate: medium compressibility.	Severe: flood hazard.	Moderate: clay loam surface layer; flood hazard.	Severe: flood hazard.	Moderate: clay loam surface layer; flood hazard.	Flooding	Flooding	High: conductivity.
Severe: slight compressibility.	None to slight.	None to slight.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 3 percent.	None to slight.	Gravelly	Gravelly	Moderate: clay loam texture.
Severe: 10 to 20 inches of borrow material.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	Severe: silty clay surface layer.	10 to 20 inches deep to bedrock.	10 to 20 inches deep to bedrock.	High: conductivity.
Severe: strongly cemented caliche at depth of 4 to 10 inches.	None to slight.	None to slight.	Moderate where slopes are 2 to 6 percent; severe where slopes are 6 to 8 percent.	None to slight.	Strongly cemented caliche at depth of 4 to 10 inches.	Strongly cemented caliche at depth of 4 to 10 inches.	High: conductivity.
Moderate: fair slope stability.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Features generally favorable.	Features generally favorable.	High: conductivity.
Severe where 20 to 24 inches deep to bedrock; moderate where 24 to 40 inches deep to bedrock; fair slope stability.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	20 to 40 inches deep to bedrock.	20 to 40 inches deep to bedrock.	High: clay texture below surface layer.

TABLE 4.—*Engineering interpretations*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir area
*Menard: MeB, MeC2, MmC2. For Weymouth part of MmC2, see Weymouth series.	Fair: 6 to 12 inches of fine sandy loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	None to slight.	Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate: moderate permeability.
Mereta: MrB	Fair: clay loam surface layer.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Severe: slow permeability; 14 to 20 inches deep to strongly cemented caliche.	Severe: 14 to 20 inches deep to strongly cemented caliche.	Severe: seepage.
Miles: MsB	Fair: 7 to 14 inches of fine sandy loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	None to slight.	None to slight.	Moderate: moderate permeability.	Moderate: moderate permeability.
Nuvalde: NuA, NuB.	Fair: clay loam surface layer.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: moderate permeability.	Severe: seepage; calcareous soils.
Olton: OcA, OcB.	Fair: clay loam surface layer.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Severe: moderately slow permeability.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 3 percent.	Moderate: moderately slow permeability.
Owens: OwB	Poor: clay surface layer.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: very slow permeability.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 7 percent; severe where slopes are 7 to 15 percent.	None to slight.

of soil properties—Continued

Degree of limitations and soil features affecting—Continued					Soil features affecting—		Corrosivity for uncoated steel and contributing soil features
Farm ponds—Continued	Recreation						
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails	Terraces and diversions	Waterways	
Moderate: fair resistance to piping and erosion.	None to slight.	None to slight.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 3 to 5 percent.	None to slight.	Features generally favorable.	Features generally favorable.	Moderate: conductivity.
Severe: 14 to 20 inches deep to strongly cemented caliche.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	14 to 20 inches deep to strongly cemented caliche.	14 to 20 inches deep to strongly cemented caliche.	High: conductivity.
Moderate: fair resistance to piping and erosion.	None to slight.	None to slight.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 3 percent.	None to slight.	Features generally favorable.	Features generally favorable.	Moderate: sandy clay loam texture.
Moderate: medium compressibility.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface iayer.	Moderate: clay loam surface layer.	Features generally favorable.	Features generally favorable.	High: conductivity.
Moderate: fair resistance to piping and erosion.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Features generally favorable.	Features generally favorable.	High: conductivity.
Moderate: fair slope stability.	Severe: clay surface layer.	Severe: clay surface layer.	Severe: clay surface layer.	Severe: clay surface. layer.	Slopes	Slopes	High: conductivity; clay texture.

TABLE 4.—*Engineering interpretations*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir area
Pedernales: PdB, PeB, PeB2.	Fair: 6 to 10 inches of fine sandy loam.	Poor: poor traffic-supporting capacity.	Severe: poor traffic-supporting capacity.	Moderate: moderate shrink-swell potential.	Severe: slow permeability.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 3 percent.	None to slight.
Portales: Mapped only in a complex with Weymouth series.	Fair: 10 to 20 inches of loam.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	None to slight.	None to slight.	Moderate: moderate permeability.	Moderate: moderate permeability.
*Purves: POB. For Owens part of POB, see Owens series.	Poor: 11 to 20 percent coarse fragments.	Poor: poor traffic-supporting capacity; high shrink-swell potential; 10 to 20 inches deep to bedrock.	Severe: poor traffic-supporting capacity; high shrink-swell potential; 10 to 20 inches deep to bedrock.	Severe: 10 to 20 inches deep to bedrock.	Severe: 10 to 20 inches deep to bedrock.	Severe: 10 to 20 inches deep to bedrock.	Severe: 10 to 20 inches deep to bedrock.
Rowena: RwA, RwB.	Fair: clay loam surface layer.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: moderately slow permeability.	None to slight.	Moderate: moderately slow permeability.
Sarita: SaC	Poor: loamy fine sand surface layer.	Fair: fair traffic-supporting capacity.	Moderate: fair traffic-supporting capacity.	None to slight.	None to slight.	Severe: seepage.	Severe: seepage.
*Somervell: SoE. For Stony land part of SoE, see Stony land.	Poor: 50 percent cobble- and gravel-size fragments.	Poor where 20 to 24 inches deep to bedrock; good where 24 to 40 inches deep to bedrock.	Severe: 20 to 40 inches deep to bedrock; slopes are 8 to 30 percent.	Severe: 20 to 40 inches inches to bedrock; slopes are 8 to 30 percent.	Severe: 20 to 40 inches deep to bedrock; slopes are 8 to 30 percent.	Severe: 20 to 40 inches deep to bedrock; slopes are 8 to 30 percent.	Severe where 20 to 36 inches deep to bedrock; moderate where 36 to 40 inches deep to bedrock; moderate permeability.
*Speck: SpB, SRB. For Tarrant part of SRB, see Tarrant series.	Fair: clay loam surface layer	Poor: 14 to 20 inches of material.	Severe: 14 to 20 inches deep to bedrock.	Severe: 14 to 20 inches deep to bedrock.	Severe: 14 to 20 inches deep to bedrock; slow permeability.	Severe: 14 to 20 inches deep to bedrock.	Severe: 14 to 20 inches deep to bedrock.

of soil properties—Continued

Degree of limitations and soil features affecting—Continued					Soil features affecting—		Corrosivity for uncoated steel and contributing soil features
Farm ponds—Continued	Recreation				Terraces and diversions	Waterways	
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails			
Moderate: fair slope stability.	None to slight.	None to slight.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 3 percent.	None to slight.	Features generally favorable.	Features generally favorable.	High: conductivity.
Moderate: fair resistance to piping and erosion.	None to slight.	None to slight.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 3 percent.	None to slight.	Features generally favorable.	Features generally favorable.	High: conductivity.
Severe: 10 to 20 inches deep to bedrock.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate where slopes are 2 to 6 percent; clay loam surface layer; severe where slopes are 6 to 8 percent.	Moderate: clay loam surface layer.	10 to 20 inches deep to bedrock.	10 to 20 inches deep to bedrock.	High: conductivity.
Moderate: fair slope stability.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam suface layer.	Features generally favorable.	Features generally favorable.	High: conductivity.
Moderate: poor resistance to piping and erosion.	Severe: loamy fine sand surface layer.	Severe: loamy fine sand surface layer.	Severe: loamy fine sand surface layer.	Severe: loamy fine sand surface layer.	Highly erodible.	Highly erodible.	Low.
Severe where 20 to 24 inches deep to bedrock; moderate where 24 to 40 inches deep to bedrock; poor resistance to piping and erosion.	Severe where slopes are 15 to 30 percent; moderate where slopes are 8 to 15 percent.	Severe where slopes are 15 to 30 percent; moderate where slopes are 8 to 15 percent.	Severe: slopes are 8 to 30 percent.	Severe where slopes are 25 to 30 percent; moderate where slopes are 15 to 25 percent; none to slight where slopes are 8 to 15 percent.	20 to 40 inches deep to bedrock.	20 to 40 inches deep to bedrock.	High: conductivity.
Severe: 14 to to 20 inches deep to bedrock.	Moderate: clay loam surface layer; slow permeability.	Moderate: clay loam surface layer.	Severe: 14 to 20 inches deep to bedrock.	Moderate: clay loam surface layer.	14 to 20 inches deep to bedrock.	14 to 20 inches deep to bedrock.	High: conductivity.

TABLE 4.—*Engineering interpretations*

Soil series and map symbols	Suitability as source of— Topsoil	Suitability as source of— Road subgrade	Degree of limitations and soil features affecting— Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir area
*Stony land: STE. Properties too variable to rate. For Owens part of STE, see Owens series.							
*Talpa: Mapped only in an undifferentiated unit with the Kavett series.	Fair: clay loam surface layer.	Poor: 6 to 20 inches of material.	Severe: 6 to 20 inches deep to bedrock.	Severe: 6 to 20 inches deep to bedrock.	Severe: 6 to 20 inches deep to bedrock.	Severe: 6 to 20 inches deep to bedrock.	Severe: 6 to 20 inches deep to bedrock.
*Tarrant: TAB, TPB. For Purves part of TPB, see Purves series.	Poor: clay surface layer.	Poor: 6 to 20 inches deep to bedrock; high shrink-swell potential; poor traffic-supporting capacity.	Severe: 6 to 20 inches deep to bedrock; high shrink-swell potential; poor traffic-supporting capacity.	Severe: 6 to 20 inches deep to bedrock; high shrink-swell potential.	Severe: 6 to 20 inches deep to bedrock.	Severe: 6 to 20 inches deep to bedrock.	Severe: 6 to 20 inches deep to bedrock.
Tobosa: ToA, ToB.	Poor: clay surface layer.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: very slow permeability.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 3 percent.	None to slight.
Valera: VcB	Poor: clay surface layer.	Poor: poor traffic-supporting capacity; high shrink-swell potential.	Severe: poor traffic-supporting capacity; high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: 20 to 40 inches deep to bedrock; moderately slow permeability.	Severe: 20 to 40 inches deep to bedrock.	Severe where 20 to 36 inches deep to bedrock; moderate where 36 to 40 inches deep to bedrock.

of soil properties—Continued

Degree of limitations and soil features affecting—Continued					Soil features affecting—		Corrosivity for uncoated steel and contributing soil features
Farm ponds—Continued	Recreation				Terraces and diversions	Waterways	
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails			
Severe: 6 to to 20 inches deep to bedrock.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate where slopes are 2 to 6 percent; clay loam surface layer; severe where slopes are 6 to 8 percent.	Moderate: clay loam surface layer.	6 to 20 inches deep to bedrock.	6 to 20 inches deep to bedrock.	High: conductivity.
Severe: 6 to 20 inches deep to bedrock.	Severe: clay surface layer.	Severe: clay surface. layer.	Severe: clay surface layer; 25 to 50 percent coarse fragments.	Severe: clay surface layer.	6 to 20 inches deep to bedrock; stones.	6 to 20 inches deep to bedrock; stones.	High: clay texture.
Moderate: fair slope stability.	Severe: clay surface layer; very slow permeability.	Severe: clay surface layer.	Severe: very slow permeability; clay surface layer.	Severe: clay surface layer.	Features generally favorable.	Features generally favorable.	High: conductivity; clay texture.
Severe where 20 to 24 inches deep to bedrock; moderate where 24 to 40 inches deep to bedrock; moderately slow permeability.	Severe: clay surface layer.	Severe: clay surface layer.	Severe: clay surface layer.	Severe: clay surface layer.	20 to 40 inches deep to bedrock.	20 to 40 inches deep to bedrock.	High: conductivity.

TABLE 4.—*Engineering interpretations*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—				
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons	Farm ponds: Reservoir area
*Weymouth: WeB, WpB, WMB. For Portales part of WpB, see Portales series; for Menard part of WMB, see Menard series.	Good	Poor where 20 to 24 inches deep to bedrock; fair where 24 to 40 inches deep to bedrock; fair traffic-supporting capacity.	Severe where slopes are 6 to 8 percent and bedrock is at depths of 20 to 36 inches; moderate where slopes are 1 to 6 percent and bedrock is at depths of 36 to 40 inches; fair traffic-supporting capacity.	None to slight.	Severe: 20 to 40 inches deep to bedrock.	Severe: 20 to 40 inches deep to bedrock.	Severe: 20 to 40 inches deep to bedrock.
Winters: WtA, WtB.	Poor where 4 to 6 inches of fine sandy loam; fair where 6 to 12 inches of fine sandy loam.	Fair: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Severe: moderately slow permeability.	None to slight where slopes are 0 to 2 percent; moderate where slopes are 2 to 3 percent.	Moderate: moderately slow permeability.
*Yahola: Ya, YCD. For Clairemont part of YCD, see Clairemont series.	Good	Fair: fair traffic-supporting capacity.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.

of soil properties—Continued

Degree of limitations and soil features affecting—Continued					Soil features affecting—		Corrosivity for uncoated steel and contributing soil features
Farm ponds—Continued	Recreation				Terraces and diversions	Waterways	
Embankments	Camp areas	Picnic areas	Playgrounds	Paths and trails			
Severe where 20 to 24 inches deep to bedrock; moderate where 24 to 40 inches deep to bedrock; poor resistance to piping and erosion.	None to slight.	None to slight.	None to slight where slopes are 1 to 2 percent; moderate where slopes are 2 to 6 percent; severe where slopes are 6 to 8 percent.	None to slight.	20 to 40 inches deep to bedrock.	20 to 40 inches deep to bedrock.	High: conductivity.
Moderate: poor resistance to piping and erosion.	None to slight.	None to slight.	None to slight where slopes are 0 to 2 percent; moderate where slopes are 2 to 3 percent.	None to slight.	Features generally favorable.	Features generally favorable.	High: conductivity.
Moderate: poor resistance to piping and erosion.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Moderate: flood hazard.	Flood hazard.	Flood hazard.	High: conductivity.

TABLE 5.—*Engineering*

[Tests performed by the Texas Highway Department in accordance with standard

Soil name and location	Parent material	Texas report No.	Depth from surface	Shrinkage		
				Limit	Lineal	Ratio
			Inches	*Pct.*	*Pct.*	
Lindy clay loam:						
6.2 miles north of junction U.S. Highway 84 and 283 and Texas Highway 206 at Coleman thence 0.4 mile east on ranch road, in pasture to the right of road (modal).	Reddish clay.	65–236–R	7–24	13	12. 5	1. 87
1.25 miles west of Rockwood on McMillian Farm in cultivated field 300 feet east of entrance lane, 650 feet south of county road (nonmodal light).	Reddish clay in geologic material consisting of alternate layers of clay, hard limestone, and soft limestone.	65–237–R	6–21	8	17. 8	2. 06
Olton clay loam:						
Eastern edge of Coleman; on a county road, 0.75 mile east of the railroad crossing, near Agriculture Building; 125 feet inside the cultivated field to the right (modal).	Terrace or outwash sediments located in Hords Creek Valley.	65–232–R 65–233–R	16–50 50–66	13 13	15. 1 11. 7	1. 95 1. 96
G. S. Fitzpatrick Farm; 0.6 mile west of Whon Post Office, in a cultivated field, 25 feet north of the road fence, and 430 feet east of the west boundary fence (nonmodal light).	Old alluvium.	65–234–R 65–235–R	18–34 34–72	13 14	13. 3 6. 7	1. 91 1. 90
Rowena clay loam:						
From road junction near Coleman Municipal Airport, 1 mile east and 0.25 mile north in the cultivated field to the left (modal).	Calcareous old alluvium.	65–238–R 65–239–R	7–28 28–44	11 16	16. 2 9. 3	1. 95 1. 85
Northeast edge of Coleman across the road north from Dry Manufacturing Co., 75 feet from field fence, 250 feet east of west field boundary (nonmodal heavy).	Calcareous old alluvium.	65–240–R 65–241–R	5–33 39–58	9 9	18. 5 17. 2	2. 03 2. 06
Tobosa clay:						
6.2 miles north of junction U.S. Highways 84 and 283 at Coleman, thence 1 mile east on ranch road; in pasture to the right of road (modal).	Calcareous clay.	65–242–R 65–243–R	18–54 54–72	8 10	17. 7 14. 7	2. 04 2. 04
East edge of Coleman; 780 feet east of north end of airport runway; 180 feet south of road (nonmodal, thick Cca).	Calcareous old alluvium.	65–244–R 65–245–R	26–48 48–58	10 10	18. 5 15. 0	2. 04 2. 03
Valera clay:						
1.25 miles east of the junction of U.S. Highway 67 and Farm Road 1026, approximately 4 miles southwest of Coleman, thence south 3 miles on a gravel road; in a cultivated field to the right (modal).	Soft impure limestone and clays.	65–229–R 65–230–R	11–22 28–46	12 14	17. 5 9. 8	1. 96 1. 93
In a field across from Texas Highway Department Building on State Highway 206, south edge of Coleman, 200 feet west of field line (nonmodal heavy).	Weathered clays and soft limestone.	65–231–R	7–30	10	18. 3	2. 00

[1] Mechanical analysis according to the AASHO Designation T 88–57 (*1*). Results obtained by this procedure may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the baiss of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes of soils.

test data

procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [1]								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—					Percentage smaller than[2]—					AASHO [3]	Unified [4]
⅜ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.005 mm.	0.002 mm.				
								Pct.			
-------	100	99	97	82	78	43	35	40	22	A-6(13)	CL
100	99	99	98	79	73	46	42	47	28	A-7-6(16)	CL
100	97	95	93	70	63	40	37	46	30	A-7-6(16)	CL
98	95	91	88	76	73	45	33	36	23	A-6(13)	CL
100	99	98	96	69	63	41	36	41	25	A-7-6(13)	CL
99	97	95	88	64	59	29	20	25	12	A-6(7)	CL
100	99	98	94	75	73	50	42	47	30	A-7-6(17)	CL
99	97	89	73	67	65	40	26	34	17	A-6(9)	CL
100	99	98	95	75	70	48	42	51	35	A-7-6(18)	CH
-------	100	99	97	82	78	54	42	46	32	A-7-6(17)	CL
100	98	95	90	78	75	50	42	47	31	A-7-6(17)	CL
99	98	96	91	81	79	54	40	40	26	A-6(14)	CL
100	99	97	92	74	71	46	40	51	36	A-7-6(18)	CH
100	98	93	86	73	72	41	31	41	27	A-7-6(15)	CL
100	99	97	94	81	76	51	43	55	33	A-7-6(18)	CH
70	63	55	49	43	42	23	17	32	18	A-6(4)	GC
100	99	97	94	84	83	53	46	51	35	A-7-6(18)	CH

[2] Used No. 270 sieve and 1-minute hydrometer reading.
[3] Based on AASHO Designation M 145-49 (*1*).
[4] Based on the Unified Soil Classification System (*9*) Tech. Memo, No. 3-357, 2 v., Waterways Experiment Station, Corps of Engineers. SCS and BPR have agreed to consider that all soils having plasticity indexes within 2 points of the A-line are to be given a borderline classification. An example of borderline classification obtained by this use is ML-CL.

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*9*) used by the SCS engineers, Department of Defense, and others, and the AASHO system (*1*) adopted by the American Association of State Highway Officials.

In the Unified system, soils are classified according to particle size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are 8 classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; 6 classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example "CH or MH."

The AASHO system is used to classify soils according to those properties that affect use in highway construction. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme is group A–7, clay soils that have low strength when wet and are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. If soil material is near a classification boundary, it is given a symbol showing both classes; for example, A–2 or A–4.

Within each group, the relative engineering value of a soil material can be indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. The AASHO classification for tested soils, with index numbers in parentheses, is shown in table 5; the estimated classification for all soils mapped in the survey area is given in table 3.

Estimated properties of the soils

Table 3 gives estimates of soil properties that are important in engineering. The estimates are based on field classification and descriptions, physical and chemical tests of selected representative samples, test data from comparable soils in adjacent areas and from detailed experience in working with the individual kind of soil in the survey area.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter.

In the column headed "Hydrologic group," the soils are placed in one of four groups on the basis of intake of water at the end of long-duration storms, after prior wetting and opportunity for swelling. Such external factors as vegetative cover and slope (gradient, length, and shape) were not considered as variables among the series; it is understood that the engineer makes adjustments for these characteristics. The definitions of the hydrologic classes are as follows:

GROUP A: Soils have a high infiltration rate, even when thoroughly wetted, and consist chiefly of deep, well-drained to excessively drained sands, gravel, or both. These soils have a high rate of water transmission that results in a low runoff potential.

GROUP B: Soils have a moderate infiltration rate when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well drained to well drained soils of moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission and a moderate runoff potential.

GROUP C: Soils have a slow infiltration rate when thoroughly wetted and consist chiefly of (1) soils with a layer that impedes the downward movement of water, or (2) soils with moderately fine to fine texture and a slow infiltration rate. These soils have a slow rate of water transmission and a high runoff potential.

GROUP D: Soils have a very slow infiltration rate when thoroughly wetted and consist chiefly of (1) clay soils with a high swelling potential; (2) soils with a high permanent water table; (3) soils with a claypan or a clay layer at or near the surface; and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission and a very high runoff potential.

In the column "Depth to bedrock" the depth in inches is shown at which consolidated material may be expected.

The column headed "Percentage passing sieve" gives the probable grain-size distribution. The estimated percentages cover the range that might be expected to occur if a large number of samples were screened.

Permeability relates only to movement of water downward through undisturbed and uncompacted soil. It does not include lateral seepage. The estimates are based on structure and porosity of the soil. Plowpans, surface crusts, and other properties resulting from the use of the soils are not considered.

Available water capacity is the capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Reaction is the degree of acidity or alkalinity of a soil, expressed as a pH value. The pH value and relative terms used to describe soil reaction are explained in the Glossary at the back of this survey.

The shrink-swell potential is an indication of the volume change to be expected of the soil material with changes in moisture content. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates hazards to the maintenance of structures constructed in, on, or with such materials.

Salinity, drainage, and a seasonal high water table do not present a serious problem in Coleman County and are not included in table 3.

Engineering interpretations of soil properties

Table 4 contains selected information useful to engineers and others who plan to use soil material in construction of highways, farm facilities, recreational facilities, and buildings. The soil features affecting the use of the soil are shown. The ratings and other interpretations in this table are based on estimated engineering properties of the soils in table 3; on available test data, including those in table 5; and on field experience.

Topsoil refers to soil material, ordinarily rich in organic matter, suitable for use as a topdressing for

lawns, gardens, roadbanks, and the like. The ratings indicate suitability for such use.

Sources of sand and gravel are limited in the county and are not listed in this table. Hilgrave soils provide some siliceous gravel, and Kimbrough and Mereta soils are sources of caliche.

Road subgrade is material used to build embankments. The ratings indicate the performance of the various soils moved from borrow areas for this purpose (*3*).

Highway location is influenced by features of the undisturbed soil that affect construction and maintenance of highways. A rating is given, and soil features affecting the rating are shown.

The factors considered for foundations for low buildings are those features and qualities of undisturbed soils that affect the suitability for supporting foundations of buildings less than three stories high. The foundation of a building transmits the weight of the structure onto the natural undisturbed soils. It is the substratum of a soil that usually provides the base for the foundation, and therefore it is the material which should be evaluated. The Unified Classification System was used for evaluating the soils in terms of their bearing capacity, shrink-swell potential, and shear strength.

Soil features that determine the limitations for septic tank filter fields and sewage lagoons are permeability, ground water levels, flooding hazards, land slopes, depth to rock or other impervious materials, and creviced material that may cause pollution of water supplies.

Farm pond reservoir areas are affected mainly by the rate of seepage and lack of adequate depth. The soils are rated and those features that influence either seepage or depth are shown.

The factors considered for farm pond embankments are the characteristic features of disturbed soil, including subsoil and substratum, that affect their suitability for constructing embankments. The primary features that affect suitability are stability, compaction characteristics, susceptibility to piping, shrink-swell potential, compacted permeability, compressibility, erosiveness, and gypsum content.

Camp area ratings apply to areas intended for use as tent and camp trailer sites and the accompanying outdoor activities. These sites are used frequently during the camping season. Areas should need little site preparation and should be suitable for unsurfaced parking for cars and camp trailers and heavy foot traffic by humans or horses, or vehicular traffic. Factors considered in establishing ratings are wetness and flooding hazards, permeability, slope, surface soil texture, coarse fragments, and stoniness or rockiness. Suitability of soil for supporting vegetation is a separate item to be considered in the final evaluation in selecting a site for these uses.

Picnic area ratings are based on soil features only and do not include other aspects of the area, such as the presence of trees or lakes, that may affect the desirability of a site. Factors considered in establishing ratings are wetness and flooding hazards, slope, surface soil texture, and stoniness and rockiness. Suitability for supporting vegetation is a separate item to be considered in the final evaluation of selecting sites for these uses.

Playground ratings apply to areas to be developed for playgrounds and organized games, such as baseball, football, badminton, and the like. These areas are subject to intensive foot traffic. Areas selected for this use generally require a nearly level surface, good drainage, and a soil texture and consistence that gives a firm surface. The most desirable soil is free of rock outcrops and coarse fragments. It is assumed that good vegetative cover can be established and maintained on areas where needed. Factors considered in evaluations are wetness hazard, flooding hazard, permeability, slope, surface soil texture, depth to hard bedrock, stoniness, and coarse fragments.

Path and trail ratings apply to areas that are to be used for trails, cross-country hiking, bridle paths, and other nonintensive uses that allow for the random movement of people. It is assumed that these areas are to be used as they occur in nature and that little soil will be moved (excavated) for the planned recreational use. Items considered in establishing ratings are wetness and flooding hazards, slope, surface soil texture, and surface stoniness or rockiness. Ratings are based on soil features only and do not include other items that may be important in the selection of a site for this use. Soils rated as having severe limitations may be best from the standpoint of natural beauty or use, but they do require more preparation or maintenance for such use.

Factors considered in constructing terraces and diversions are extreme slopes, depth to rock or other unfavorable material, stability of soil material, and flooding hazard.

Grassed waterways are developed on soils to carry off excess water that is discharged from terraces, diversions, and other areas. Steep topography, shallow depth, erosiveness, low fertility, stability of soil material, and flooding hazards are some of the features that adversely affect the establishing of waterways.

Corrosivity classes and contributing soil features are given for uncoated steel, based on soil conditions at a depth of 4 feet. Steel pipes should have a protective coating to retard corrosion when placed in any soil in the county.

Corrosivity ratings for concrete are not given, because all except Bonti soils have a low rating. Bonti soils have a moderate rating because they are medium acid.

Engineering test data

Table 5 contains the results of engineering tests performed by the Texas Highway Department Testing Laboratory on ten soils in Coleman County. The table shows the specific location where samples were taken, the depth of sampling, and the results of tests to determine particle-size distribution and other properties significant in the use of soils for engineering purposes.

As moisture is removed from a soil, the volume of the soil decreases, in direct proportion to the loss of moisture, until a condition of equilibrium, called the shrinkage limit, is reached. Beyond the shrinkage limit, more moisture may be removed, but the volume of soil does not change. In general, the lower the shrinkage limit, the higher the content of clay.

Lineal shrinkage is the decrease of the soil mass, in one dimension, that occurs when the moisture content is reduced from a stipulated percentage to the content at shrinkage limit. Lineal shrinkage is expressed as a percentage of the original dimension.

The shrinkage ratio is the volume change resulting from the drying of soil material, divided by the loss of moisture caused by drying. The volume change used in computing the shrinkage ratio is the change in volume that takes place in a soil when it dries from a given moisture content to a point where no further shrinkage takes place.

Mechanical analyses show percentages, by weight, of soil particles that pass through sieves of specified sizes. Sand and other coarser materials do not pass through the No. 200 sieve; silt and clay do pass through. Silt is that material larger than 0.002 millimeter in diameter that passes through the No. 200 sieve, and clay is that fraction passing through the No. 200 sieve that is smaller than 0.002 millimeter in diameter. The clay fraction was determined by the hydrometer method, rather than the pipette method most soil scientists use in determining the clay in soil samples.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a solid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from solid to plastic. The liquid limit is the moisture content at which the material changes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Use of the Soils for Wildlife [4]

Antelope, black bear, lesser prairie chicken, buffalo, and prairie dogs were once abundant in Coleman County. Deer, turkey, raccoon, ringtail cat, rabbits, and squirrel were plentiful along the wooded streams. The bald eagle and golden eagle formerly lived along the Colorado River. Antelope, prairie chicken, bear, and buffalo were killed about the time the county was settled. After the county was settled and livestock were introduced, overgrazing, fencing, and cultivation limited the number of deer, turkey, and squirrel. Prairie dogs, once numerous, are now scarce in this county.

A small number of scaled quail and a large number of bobwhite quail, doves, songbirds, small animals, and predators still inhabit the county. Among these are red and gray fox, coyote, and other small animals.

The lakes, streams, ponds, and grain fields attract many ducks and geese during migration. Many artificial impoundments such as Lake Coleman, Lake Scarborough, Old City Lake, Hords Creek Reservoir, Gouldbusk City Lake, Rockwood City Lake, Santa Anna City Lake, Novice City Lake, flood prevention structures, oil company lakes, and ponds on farms and ranches offer opportunities for fishing and other recreational facilities. Jim Ned Creek, Hords Creek, Home Creek, Mukewater Creek, the Colorado River, and many smaller streams also offer recreational opportunities.

[4] By EDWARD M. SCHWILLE, soil conservationist, Soil Conservation Service.

Soil interpretations for wildlife habitat

Successful management of wildlife on any tract of land requires that food, cover, and water be available in a suitable combination. Lack of any one of these, an unfavorable balance, or inadequate distribution, may severely limit or cause the absence of desired wildlife. Soil information provides a valuable tool for creating, improving, or maintaining suitable food, cover, and water for wildlife.

Most wildlife habitats are managed by planting suitable vegetation, by manipulating existing vegetation so as to bring about natural establishment, increase, or improvement of desired plants, or by combinations of such measures. Soil influence on plant growth is known for many kinds of plants and can be inferred for others from a knowledge of soil characteristics and behavior. In addition, water areas can be created or natural ones improved for wildlife habitats.

Soil interpretations for wildlife habitat serve a variety of purposes. They aid in selecting the more suitable sites for various kinds of management. They serve as indicators of the level of management needed to achieve satisfactory results. They also show why it may not be feasible to manage a particular area for a given kind of wildlife.

These interpretations also may serve in broad-scale planning of wildlife management areas, parks, and nature areas, or for acquiring wildlife lands.

Soil properties affect the growth of plants in a wildlife habitat, and indirectly, the wildlife population. The soil properties most significant in plant growth are (1) thickness of soil useful to crops, (2) texture of the surface layer, (3) available water capacity to a depth of 40 inches, (4) wetness, (5) stoniness or rockiness at the surface, (6) flood hazard, and (7) slopes.

The soil areas shown on the soil survey maps are rated as wildlife habitat without regard to their position in relation to adjoining delineated areas. The size, shape, or location of the outlined area does not affect the rating. Certain influences on habitats, such as elevation and aspect, must be appraised on the site.

In table 6 the soils of Coleman County are rated for the creation, improvement, or maintenance of four wildlife habitat elements. These ratings are based on limitations imposed by the characteristics or behavior of the soil. Four levels of suitability are recognized: well suited, suited, poorly suited, and unsuited.

Wildlife habitat elements

The four habitat elements rated in table 6 are defined and exemplified as follows:

Grain and seed crops are agricultural grains or seed-producing annuals planted to produce food for wildlife. Examples are corn, sorghums, millets, soybeans, wheat, oats, and sunflower.

Grasses and legumes are domestic perennial grasses and legumes that are established by planting and which furnish food and cover for wildlife. Examples of grasses are bahia, ryegrass, fescue, and panic grasses. Examples of legumes are clovers, annual lespedezas, and bush lespedezas.

Wild herbaceous upland plants are perennial grasses, forbs, and weeds that provide food and cover

TABLE 6.—*Use of soil for wildlife*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series that appear in the first column of this table.]

Soil series and map symbols	Wildlife habitat elements				Kinds of wildlife	
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Openland wildlife	Brushland wildlife
Abilene: AbA, AbB	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Badland: BA	Unsuited	Unsuited	Poorly suited	Unsuited	Poorly suited	Poorly suited.
*Bonti:						
BoB	Suited	Well suited	Well suited	Suited	Suited	Well suited.
BNB, BWB	Unsuited	Suited	Well suited	Suited	Poorly suited	Well suited.
For Owens part of BWB, see Owens series.						
Callahan: CaB, CcB	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Clairemont: Cm	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Clairemont, clayey variant: Cn	Poorly suited	Suited	Suited	Suited	Suited	Well suited.
Frio:						
Fo	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Fr	Poorly suited	Suited	Suited	Suited	Suited	Well suited.
Hilgrave, clayey variant: HgB	Poorly suited	Suited	Suited	Suited	Suited	Well suited.
*Kavett:						
KvB	Poorly suited	Poorly suited	Suited	Suited	Poorly suited	Suited.
KAB	Unsuited	Poorly suited	Suited	Suited	Poorly suited	Suited.
For Talpa part of KAB, see Talpa series.						
*Kimbrough: KMB	Unsuited	Unsuited	Poorly suited	Unsuited	Poorly suited	Poorly suited.
For Mereta part of KMB, see Mereta series.						
Krum: KwB, KwC	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Lindy: LdA, LdB	Suited	Well suited	Well suited	Suited	Suited	Well suited.
*Menard: MeB, MeC2, MmC2	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
For Weymouth part of MmC2, see Weymouth series						
Mereta: MrB	Poorly suited	Suited	Suited	Suited	Suited	Suited.
Miles: MsB	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Nuvalde: NuA, NuB	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Olton: OcA, OcB	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Owens: OwB	Poorly suited	Poorly suited	Suited	Unsuited	Poorly suited	Poorly suited.
Pedernales: PdB, PeB, PeB2	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Portales	Suited	Well suited	Well suited	Suited	Well suited	Well suited.
*Purves: POB	Poorly suited	Poorly suited	Suited	Suited	Poorly suited	Suited.
For Owens part of POB, see Owens series.						
Rowena: RwA, RwB	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
Sarita: SaC	Poorly suited	Suited	Suited	Suited	Suited	Well suited.
*Somervell: SoE	Unsuited	Poorly suited	Suited	Suited	Poorly suited	Suited.
For Stony land part of SoE, see Stony land.						
*Speck: SpB, SRB	Poorly suited	Poorly suited	Suited	Suited	Poorly suited	Suited.
For Tarrant part of SRB, see Tarrant series.						
*Stony land: STE	Unsuited	Unsuited	Poorly suited	Poorly suited	Poorly suited	Poorly suited.
For Owens part of STE, see Owens series.						
Talpa	Unsuited	Poorly suited	Suited	Suited	Poorly suited	Suited.
*Tarrant: TAB, TPB	Unsuited	Poorly suited	Suited	Suited	Poorly suited	Suited.
For Purves part of TPB, see Purves series.						
Tobosa: ToA, ToB	Suited	Suited	Suited	Suited	Suited	Suited.
Valera: VcB	Suited	Suited	Suited	Suited	Suited	Suited.

TABLE 6.—*Use of soil for wildlife*—Continued

Soil series and map symbols	Wildlife habitat elements				Kinds of wildlife	
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood trees and shrubs	Openland wildlife	Brushland wildlife
*Weymouth: WeB, WpB, WMB. For Portales part of WpB, see Portales series. For Menard part of WMB, see Menard series.	Suited	Well suited	Well suited	Suited	Well suited	Well suited.
Winters: WtA, WtB	Well suited	Well suited	Well suited	Suited	Well suited	Well suited.
*Yahola: Ya, YCD. For Clairemont part of YCD, see Clairemont series.	Suited	Suited	Well suited	Suited	Well suited	Well suited.

for wildlife. Examples of these are beggarweed, perennial lespedezas, wild bean indiangrass, wild ryegrass, and bluestems.

Hardwood trees and shrubs are nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, or foliage (browse) used extensively as food by wildlife. These plants commonly become established through natural processes, but may be planted. Examples are oak, mesquite, whitebrush, granjeno, catclaw, cherry grape, honeysuckle, greenbrier, autumn olive, and multiflora rose.

The following habitat elements are not rated in table 6 because all of the soils are unsuited, except Tobosa soils, which are poorly suited.

Wetland food and cover plants are annual and perennial wild herbaceous plants that grow in moist to wet sites, exclusive of submerged or floating aquatics. Examples are smartweed, wild millet, bulrush, spike sedge, rushes, sedges, burreeds, wild rice cutgrass, sourdock, and cattails.

Shallow water developments are low dikes and water-control structures established to create habitat principally for waterfowl. They may be designed to allow for draining, planting, and flooding, or they may be used as permanent impoundments to grow submerged aquatic plants.

Kinds of wildlife

The three general kinds of wildlife are defined as follows:

Openland wildlife is birds and mammals that normally frequent cropland, pastures, and areas that are overgrown with grasses, herbs, and shrubby growth. Examples of this kind of wildlife are quail, cottontail rabbits, jackrabbits, meadow larks, and lark sparrows.

Brushland wildlife is birds and mammals that normally frequent wooded areas of hardwood trees and shrubs. Examples of brushland wildlife are deer, turkey, squirrel, raccoon, and javelina.

Wetland wildlife is birds and mammals that normally frequent such areas as ponds, streams, ditches, marshes, and swamps. Examples of this kind of wildlife are ducks, geese, rails, shorebirds, and snipe.

The two kinds of wildlife common in this county, openland wildlife and brushland wildlife, are rated in table 6.

Suitability ratings of soils for wildlife

The following definitions are given for habitat suitability ratings used in table 6:

Well suited indicates that habitats generally are easily created, improved, or maintained; that the soil has few or no limitations that affect management; and that satisfactory results can be expected.

Suited indicates that habitats can be created, improved, or maintained in most places; that the soil has moderate limitations that affect management; and that moderate intensity of management and fairly frequent attention may be required for satisfactory results.

Poorly suited indicates that habitats can be created, improved, or maintained in most places; that the soil has rather severe limitations; that habitat management is difficult and expensive and requires intensive effort; and that results are not always satisfactory. (For short-term usage, soils rated as "poorly suited" may provide easy establishment and temporary values).

Unsuited indicates that the soil limitation is so extreme that it is impractical, if not impossible, to manage the designated habitat element. Unsatisfactory results are probable.

Formation and Classification of the Soils

This section contains two parts. First, the five major factors of soil formation and the process involved in soil horizon differentiation are discussed briefly in terms of

their effect on the soils of Coleman County. Second, the system of classifying soils is discussed, and the soils are placed in the system.

Factors of Soil Formation

Soil is the thin layer of material at the earth's surface that will support the growth of plants. It is the product of the interaction of several factors in nature. The main factors are (1) the physical and mineralogical composition of the parent materials; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the soil material.

Climate and vegetation are active factors of soil genesis. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body with genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. It may be much or little, but some time is always required for horizon differentiation. Usually a long time is required for the development of distinct horizons.

The factors of soil genesis are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent material

Parent material is the unconsolidated mass of material from which the soil profile is formed. It consists of the loose earth materials above solid rock and below the soil. As the parent material is modified over time by living organisms and other soil-building forces, it becomes soil. In soils such as the Bonti and Purves, all or nearly all of the parent material has developed into soil, and these soils are directly on hard rock. The parent material determines the limits of chemical and mineralogical composition of the soil.

The soils of Coleman County have formed from a variety of earth materials, including limestone, sandstone, shale, loamy to clayey alluvium, and a small amount of wind-deposited sand. The limestone is mainly of Pennsylvanian, Permian, or Cretaceous age. It ranges in hardness from hard crystalline limestone to soft impure limestone and marly earth.

The sandstone in the eastern part of the county near the Pennsylvanian-Permian boundary is dominantly a hard sandstone formed from old channel deposits. Sandstone of Cretaceous age, mainly in the northwestern part of the county, is mostly weakly cemented and mixed with clay and lime.

The shale ranges from clayey and brittle material, which breaks out in characteristic plates and layers and will not slake in water, to massive shaly clay that will slake and disperse in water.

The limestones, sandstones, and shales were weathered and reworked by water and other agencies before and during the development of the soils that now occupy the landscape.

Climate

As soils develop from wind- and water-deposited materials, several changes take place that are caused by climate. Where there is abundant rainfall, moisture moves downward through the top layer, which is called the A horizon. This moisture dissolves and carries away minerals such as sodium, calcium, and magnesium. Insoluble clay minerals and iron oxides are deposited in the next lower layer, which is called the B horizon. The B horizon grades downward to the C horizon, which consists of unchanged or partially weathered material like that from which the soil was formed.

Coleman County has a subhumid climate, and temperatures are moderate. Rainfall is not sufficiently heavy to cause much loss or movement of minerals. Most soils of the county have relatively weakly developed profiles. Calcium carbonate remains in the soil in a whitish form called caliche. It is at varying depths, depending on the other factors of soil formation. Some soils in the county do not contain calcium carbonate, apparently because it was in low supply or absent in the parent material.

Living organisms

Plants and animals, ranging in size from microscopic organisms to large animals and trees, have an important part in soil formation. In Coleman County, the prairie grasses exerted a greater influence than other plants on soil formation. These grasses protected the surface from erosion and from extreme heat during summer. The grass roots reached deep into the soil, and they brought up minerals from below. Decomposing litter, plant roots, and animal wastes added a continuous supply of organic matter to the soil. Decaying grass roots left channels that permitted air and water to penetrate the soil. Earthworms and other soil organisms also helped to channel water and air through the soil.

The processes of soil formation were balanced under natural conditions, before man began using the soil. Intensive grazing, tilling, and other human activities have altered the soil-forming factors. Much of the native vegetation has been destroyed. Accelerated erosion has removed much of the surface layer in many areas. The activity of micro-organisms and earthworms also has been greatly reduced.

Relief

Topography, or relief, affects soil formation through its influence on drainage, erosion, plant cover, and soil temperature. The topography of Coleman County ranges from nearly level to moderately steep. Soils such as the Olton, which formed in nearly level to gently sloping areas, are deeper and have more distinct horizonation than soils such as the Owens and Weymouth, which formed on gently sloping to sloping hillsides and ridges. The soils in lower positions are deeper and have more distinct horizons because they receive extra water, have less runoff, and are subject to less erosion.

Time

Time, usually a long time, is required for formation of soils that have distinct horizons. The differences in length

of time that parent materials have been in place are commonly reflected in the degree of development of the soil profile.

The soils of Coleman County range from young to old. The young soils have little profile development, but the old soils have well expressed soil horizons. Yahola soils are an example of young soils lacking development. Miles soils are an example of older soils that have well-formed horizons. Miles soils have distinct A and B horizons that bear little resemblance to the original parent material.

Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and revised later (*6*). The system currently used by the National Cooperative Soil Survey was developed in the early sixties (*5*) and adopted in 1965 (*8*). It is under continual study.

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 7 shows the classification of each soil series of Coleman County by family, subgroup, and order, according to the current system.

TABLE 7.—*Classification of soil series according to the current system*

Series	Family	Subgroup	Order
Abilene [1]	Fine, mixed, thermic	Pachic Argiustolls	Mollisols.
Bonti	Fine, mixed, thermic	Ultic Paleustalfs	Alfisols.
Callahan	Fine, mixed, thermic	Typic Haplustalfs	Alfisols.
Clairemont	Fine-silty, mixed (calcareous), thermic	Typic Ustifluvents	Entisols.
Clairemont, clayey variant.	Clayey, mixed (calcareous), thermic	Typic Ustifluvents	Entisols.
Frio	Fine, mixed, thermic	Cumulic Haplustolls	Mollisols.
Hilgrave, clayey variant.	Clayey-skeletal, mixed, thermic	Typic Haplustalfs	Alfisols.
Kavett	Clayey, montmorillonitic, thermic, shallow	Petrocalcic Calciustolls	Mollisols.
Kimbrough [2]	Loamy, mixed, thermic, shallow	Paleorthidic Calciustolls	Mollisols.
Krum	Fine, mixed, thermic	Vertic Haplustolls	Mollisols.
Lindy [3]	Fine, mixed, thermic	Udic Haplustalfs	Alfisols.
Menard	Fine-loamy, mixed, thermic	Typic Haplustalfs	Alfisols.
Mereta	Clayey, mixed, thermic, shallow	Petrocalcic Calciustolls	Mollisols.
Miles	Fine-loamy, mixed, thermic	Udic Paleustalfs	Alfisols.
Nuvalde	Fine, mixed, thermic	Typic Calciustolls	Mollisols.
Olton	Fine, mixed, thermic	Aridic Paleustolls	Mollisols.
Owens	Clayey, mixed, thermic, shallow	Typic Ustochrepts	Inceptisols.
Pedernales	Fine, mixed, thermic	Udic Paleustalfs	Alfisols.
Portales	Fine-loamy, mixed, thermic	Aridic Calciustolls	Mollisols.
Purves	Clayey, montmorillonitic, thermic	Lithic Calciustolls	Mollisols.
Rowena	Fine, mixed, thermic	Vertic Calciustolls	Mollisols.
Sarita [4]	Loamy, mixed, hyperthermic	Grossarenic Paleustalfs	Alfisols.
Somervell	Loamy-skeletal, carbonatic, thermic	Typic Calciustolls	Mollisols.
Speck	Clayey, mixed, thermic	Lithic Argiustolls	Mollisols.
Talpa	Loamy, mixed, thermic	Lithic Calciustolls	Mollisols.
Tarrant	Clayey-skeletal, montmorillonitic, thermic	Lithic Calciustolls	Mollisols.
Tobosa	Fine, montmorillonitic, thermic	Typic Chromusterts	Vertisols.
Valera	Fine, montmorillonitic, thermic	Petrocalcic Calciustolls	Mollisols.
Weymouth	Fine-loamy, mixed, thermic	Typic Ustochrepts	Inceptisols.
Winters [5]	Fine, mixed, thermic	Udic Paleustalfs	Alfisols.
Yahola	Coarse-loamy, mixed (calcareous), thermic	Typic Ustifluvents	Entisols.

[1] The Abilene soils mapped in Coleman County are taxadjuncts to the series because they lack soft secondary carbonates within 24 inches of the surface, but this does not alter their usefulness or behavior.

[2] The Kimbrough soils mapped in Coleman County are outside the range of the series because they have a clay loam textured A horizon.

[3] The Lindy soils mapped in Coleman County are taxadjuncts to the series because the reaction of the Bt horizon is mildly to moderately alkaline, but this does not alter their usefulness or behavior.

[4] The Sarita soils mapped in Coleman County are taxadjuncts to the series because they are a few degrees cooler, color of the B horizon is redder, and they lack gray mottles in the B horizon, but this does not alter their usefulness or behavior.

[5] The Winters soils mapped in Coleman County are outside the range of the series because they have a clay B2t horizon.

Additional Facts About the County

The area around Trickham was the first part of Coleman County to be settled. This early settlement reputedly was the last town on the Chisholm Trail north to Kansas. Most of the early settlers depended on small farms and small herds of livestock for a livelihood. Several army outposts and stagecoach way stations, such as Camp Colorado and the Leaday Station, were in operation prior to and following the Civil War to protect settlers from the Indians and to provide fresh horses for the stages. These stations maintained small herds of cattle and horses and cultivated some land for food.

Cattle ranching as an industry began about 1863. Ranches at first depended solely on native grasses for livestock feed. The thick growth of nutritious grasses and the mild climate made this area especially suitable for raising livestock. Sheep were introduced about 1900, and are now a major enterprise.

Cultivation of crops on a large scale began about 1900. Cotton, small grain, and sorghum were the primary crops.

Climate [5]

Coleman County lies in the transitional zone between the humid climate of east Texas and the semiarid climate to the west and northwest. The average annual rainfall is 27.04 inches (table 8). Precipitation is heaviest from April through October. The greatest rainfall is from April through June, and the next greatest rainfall is in September and October. Much of the rain falls during thunderstorms. Total monthly and yearly precipitation varies widely. The greatest annual precipitation was 45.28 inches, recorded in 1935, and the least was 13.32 inches, recorded in 1917.

Some sleet or light snow may fall in winter, but it is of little significance as a source of moisture. Several consecutive seasons sometimes pass without measurable amounts of snow. Most precipitation in winter is in the form of a slow, continuous, light rain or drizzle.

The continental climate of Coleman County is characterized by large seasonal variations in temperature. In winter, temperature changes rapidly as cold, dry, polar air alternates with warm, moist, tropical air. The temperature sometimes falls as much as 20° F. in an hour when a cold front, or "norther," moves over the county. Usually within 2 days after the cold front passes, southerly winds from the Gulf of Mexico return and rapidly moderate the low temperatures. Thus, periods of very cold weather are short, and even in January, fair, mild weather is common.

In spring, cold fronts become weaker and less frequent and temperatures are mild and pleasant.

Summers are hot, especially July and August. Several consecutive days that have maximum temperatures of 100° or more are not uncommon.

Autumn is perhaps the most delightful season of the year, a time when temperatures are neither excessively hot nor cold. Temperatures during the first half of September remain fairly high, but they begin to fall as northers increase in frequency and intensity during the last half of the month. With few exceptions, the weather remains quite mild through the first half of December.

Prevailing winds are southerly and occasionally become strong and persistent from the south or southwest for several days. The strongest winds are from a northerly direction and are associated with the passage of cold fronts. Dust storms are infrequent and are the result of soil blowing from areas far to the west and northwest.

Violent wind or hailstorms may accompany thunderstorms late in spring and early in summer, but these are infrequent. Only seven tornadoes are known to have touched ground in Coleman County in the 70-year period, 1896–1965.

Coleman County receives about 65 to 70 percent of the total possible sunshine annually. The average annual relative humidity is about 60 percent, with only minor variations from month to month. Daily changes in relative humidity are significant. Average humidity is 75 to 80 percent at 6 a.m., 50 to 55 percent at noon, 40 to 45 percent at 6 p.m., and 65 to 70 percent at midnight.

The average annual Class "A" (4-foot diameter, standard Weather Bureau type) pan evaporation is estimated at 95 inches. The average annual lake evaporation is 66 inches.

The average length of the warm season (freeze-free period) in Coleman County is 242 days. The average dates of the last occurrence of 32° (or lower) in the spring, and the first occurrence of 32° (or lower) in the fall, are March 22 and November 19, respectively.

Physiography and Geology

Coleman County is mainly gently sloping soils on upland. The most outstanding topographic features are the conspicuous mesalike mountains that are remnants of former higher uplands. Examples are the Santa Anna Mountains, near the town Santa Anna; Bead Mountain, near Valera; Robinson Peak, near Silver Valley; and the high upland areas in the northwestern part of the county, near Glen Cove. The upland areas near Glen Cove are the largest. They stand out sharply above the surrounding country because they have abrupt slopes and are about 200 to 350 feet higher than the surrounding land.

These higher areas are geologic materials of Cretaceous Age (*4*) that covered the entire county to a depth of several hundred feet some 60 million years ago. Except for about 10 percent of the county, this Cretaceous material has since been removed by geologic erosion. Materials of Permian Age, which were deposited more than 120 million years ago, have been exposed and, in the southeastern part of the county, Pennsylvanian Age material deposited about 250 million years ago has been exposed. These, together with alluvium and a small amount of wind-deposited materials of Recent Age, deposited less than a million years ago, are the source of the parent materials of the soils.

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[5] By ROBERT B. ORTON, climatologist for Texas, National Weather Service, U.S. Department of Commerce.

TABLE 8.—*Temperature and*

Month	Temperature: Average daily maximum	Average daily minimum	Average monthly	Number of days [1]: Maximum of 90° and above	Minimum of 32° and below
	° F.	° F.	° F.		
January	60.6	32.9	46.8	0	17
February	65.0	36.9	51.0	0	9
March	72.5	42.6	57.6	1	6
April	80.9	51.9	66.4	6	1
May	86.3	60.0	73.2	12	0
June	92.8	67.2	80.0	22	0
July	96.9	69.5	83.2	27	0
August	98.0	69.3	83.7	29	0
September	90.4	62.8	76.6	17	0
October	80.8	53.3	67.1	3	0
November	68.3	41.6	55.0	0	4
December	61.5	35.5	48.5	0	12
Year	79.5	52.0	65.8	117	49

[1] Period of record, 1954–63.
[2] Trace too small to measure.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is low from this cause.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in many soils of warm-temperature areas, as in the Southwestern States. The material may consist of soft, thin layers in the soil or of hard, thick beds just beneath the solum, or it may be exposed at the surface by erosion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

precipitation data

Precipitation								
Average monthly	Record daily	Year of record	One year in 10 will have—		Number of days with[1]—			Average monthly snow and sleet
			Less than	More than	0.1 inch or more	0.5 inch or more	1.0 inch or more	
Inches	*Inches*		*Inches*	*Inches*				
1. 53	3. 24	1961	([3])	3. 82	3	1	([3])	1. 0
1. 25	3. 01	1935	0. 18	2. 70	3	1	([3])	. 2
1. 25	2. 53	1953	. 13	2. 35	2	([3])	0	. 1
2. 86	3. 49	1957	. 79	5. 53	5	3	1	. 1
4. 42	7. 26	1956	1. 38	6. 69	6	3	1	0
3. 13	3. 94	1951	. 36	6. 79	5	3	2	0
2. 29	4. 02	1945	. 15	4. 43	3	2	1	0
1. 89	3. 00	1940	. 03	4. 59	3	1	([3])	0
3. 04	4. 03	1936	. 23	5. 74	4	2	1	0
2. 57	4. 12	1949	. 10	5. 11	4	2	([3])	0
1. 50	1. 79	1954	. 14	3. 43	3	1	1	([3])
1. 31	1. 59	1943	. 05	2. 73	3	1	([3])	. 3
27. 04	7. 26	1956	17. 32	38. 20	44	20	7	1. 7

[3] Less than one-half.
[4] In May.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age of landform.

Gilgai. Typically, the microrelief of Vertisols—clayey soils that have a high coefficient of expansion and contraction with changes in moisture; usually a succession of microbasins and microknolls, in nearly level areas, or of microvalleys and microridges that run with the slope.

Gravel (gravelly soil material). The textural class name of a soil that is 15 to 50 percent, by volume, rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Loam. The textural class name of any soil that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The capacity of a soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Plowpan. A compacted layer formed in the soil immediately below the plowed layer.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Range condition. The state of health or productivity of both soil and forage in a given range, in terms of what productivity could or should be under normal climate and the best practical management. Condition classes generally recognized are—*excellent, good, fair,* and *poor.* The classification is based on the percentage of original, or climax, vegetation on the site, as compared to what ought to grow on it if management were good.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction, because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of land surface, considered collectively.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular.* Structureless soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

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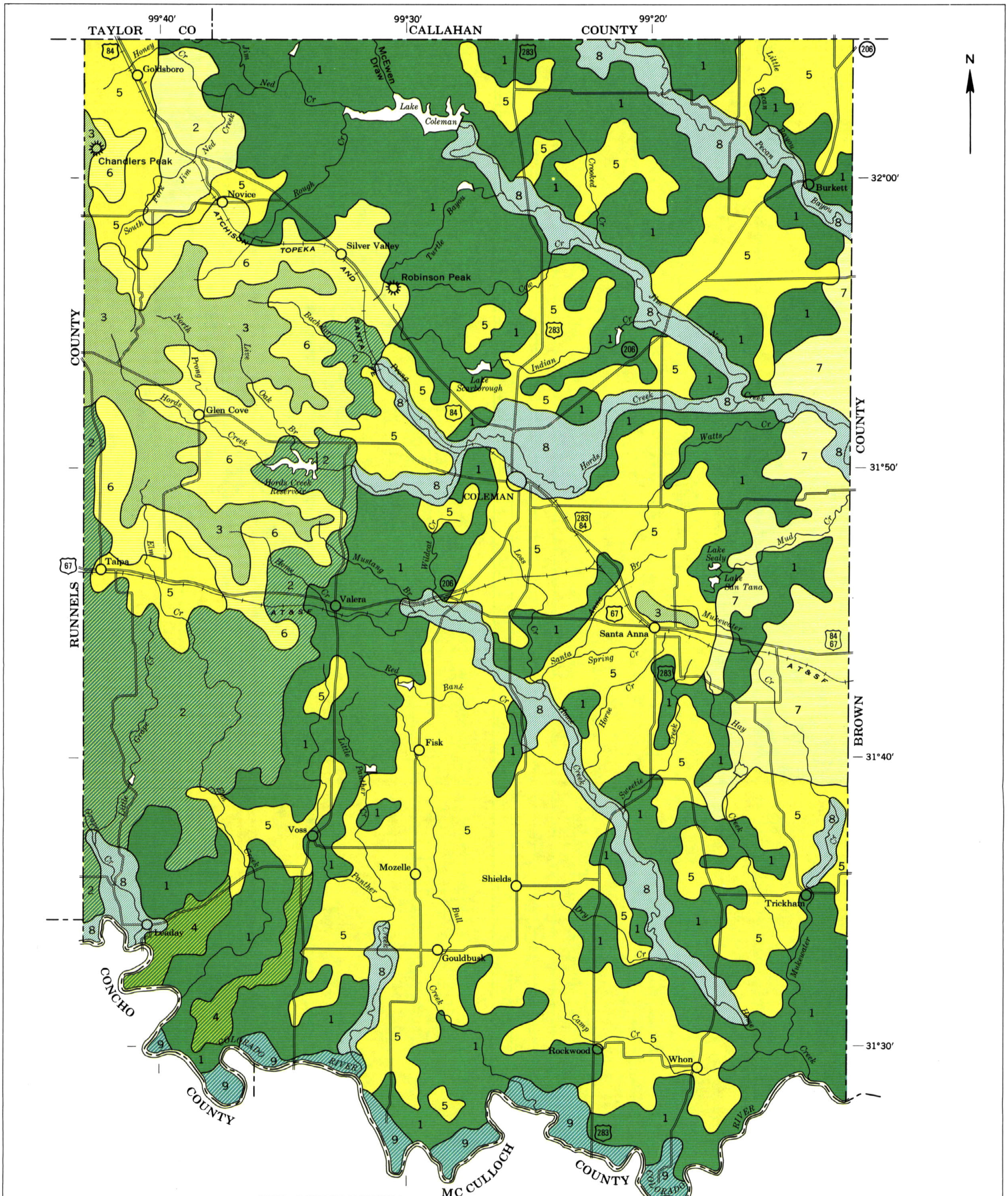


SOIL ASSOCIATIONS*

VERY SHALLOW OR SHALLOW SOILS OVER LIMESTONE, SHALY CLAY, OR STRONGLY CEMENTED CALICHE

1	Tarrant-Purves-Owens association: Very shallow to shallow, gently sloping to moderately steep, loamy and clayey soils over limestone and shaly clay
2	Kavett-Talpa association: Very shallow to shallow, gently sloping and undulating, clayey and loamy soils over limestone
3	Tarrant association: Very shallow to shallow, undulating, clayey soils over limestone
4	Kimbrough-Mereta association: Very shallow to shallow, gently sloping to undulating, loamy soils over strongly cemented caliche

MODERATELY DEEP OR DEEP SOILS OVER LIMESTONE OR SANDSTONE, OR FORMED IN OLD ALLUVIAL SEDIMENTS

5	Tobosa-Rowena-Valera association: Deep to moderately deep, nearly level to gently sloping, clayey and loamy soils over limestone or formed in old alluvium
6	Menard-Pedernales association: Deep, gently sloping, loamy soils formed in old alluvium
7	Bonti-Olton-Rowena association: Moderately deep to deep, nearly level to gently sloping and undulating, loamy soils over sandstone or formed in old alluvium

DEEP SOILS FORMED IN RECENT OR OLD ALLUVIAL SEDIMENTS

8	Frio-Olton association: Deep, nearly level to gently sloping, loamy soils formed in old or recent alluvium
9	Miles-Clairemont-Yahola association: Deep, nearly level to strongly sloping, loamy soils formed in old or recent alluvium

* Terms for texture in the name of the soil associations refer to the surface layer of the major soils.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

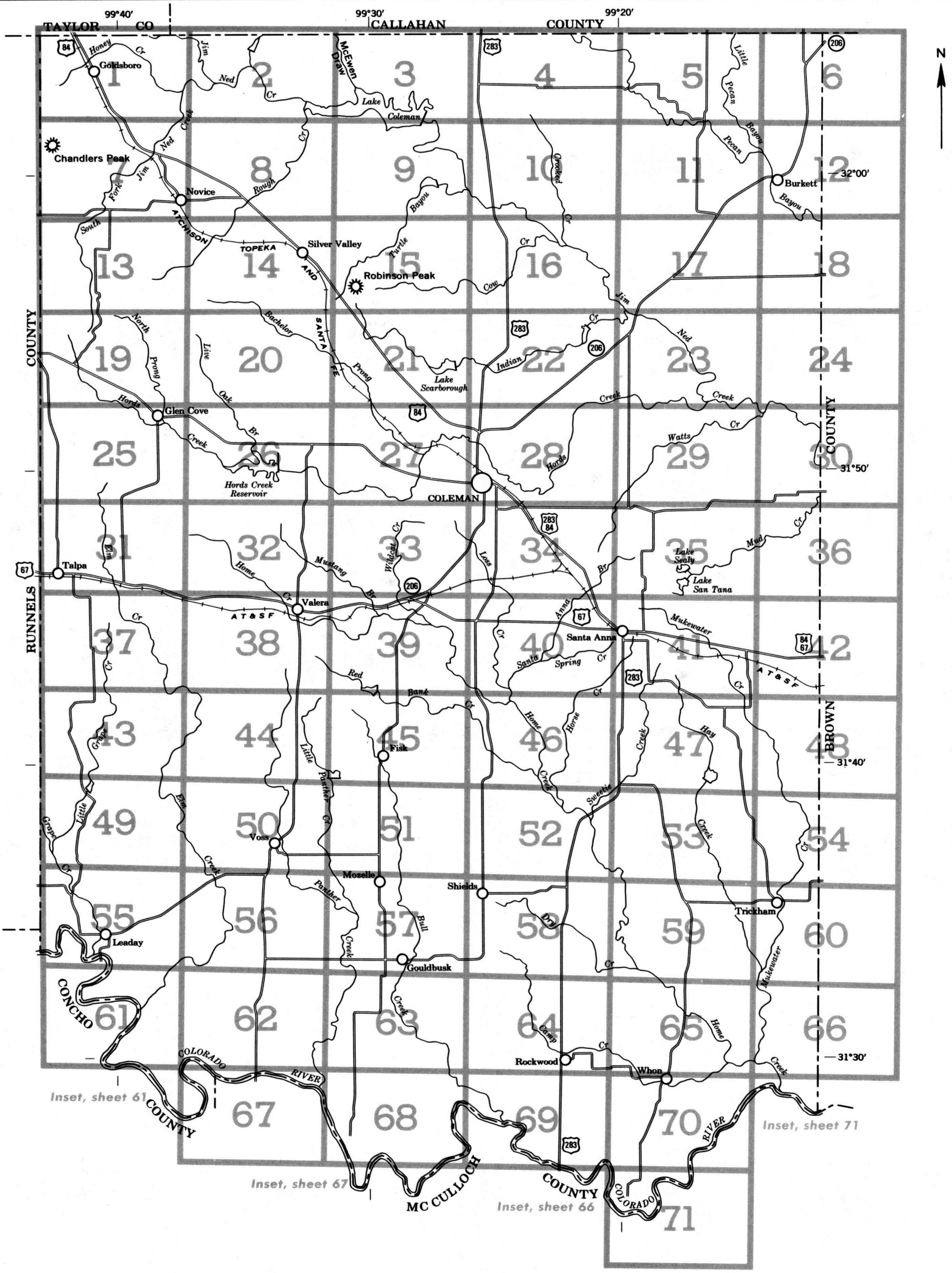
COLEMAN COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

Compiled 1972

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS

COLEMAN COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

SOIL LEGEND

The first letter, always a capital, is the initial one of the soil name. The second letter is a capital if the mapping unit is one of the low intensity survey; otherwise it is a small letter. The third letter, always a capital, A, B, C, D, or E, shows the slope. Most symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range of slope. A final number, 2, in the symbol indicates that the soil is eroded.

MEDIUM INTENSITY

SYMBOL	NAME
AbA	Abilene clay loam, 0 to 1 percent slopes
AbB	Abilene clay loam, 1 to 3 percent slopes
BoB	Bonti fine sandy loam, 1 to 3 percent slopes
CaB	Callahan loam, 1 to 3 percent slopes
CcB	Callahan clay loam, 1 to 3 percent slopes
Cm	Clairemont silt loam
Cn	Clairemont silty clay loam, clayey variant
Fo	Frio clay loam
Fr	Frio clay loam, frequently flooded
HgB	Hilgrave gravelly loam, clayey variant, 1 to 3 percent slopes
KvB	Kavett silty clay, 1 to 3 percent slopes
KwB	Krum clay loam, 1 to 3 percent slopes
KwC	Krum clay loam, 3 to 5 percent slopes
LdA	Lindy clay loam, 0 to 1 percent slopes
LdB	Lindy clay loam, 1 to 3 percent slopes
MeB	Menard fine sandy loam, 1 to 3 percent slopes
MeC2	Menard fine sandy loam, 1 to 5 percent slopes, eroded
MmC2	Menard-Weymouth complex, 1 to 5 percent slopes, eroded
MrB	Mereta clay loam, 1 to 3 percent slopes
MsB	Miles fine sandy loam, 1 to 3 percent slopes
NuA	Nuvalde clay loam, 0 to 1 percent slopes
NuB	Nuvalde clay loam, 1 to 3 percent slopes
OcA	Olton clay loam, 0 to 1 percent slopes
OcB	Olton clay loam, 1 to 3 percent slopes
OwB	Owens clay, 1 to 3 percent slopes
PdB	Pedernales loamy fine sand, 1 to 3 percent slopes
PeB	Pedernales fine sandy loam, 1 to 3 percent slopes
PeB2	Pedernales fine sandy loam, 1 to 3 percent slopes, eroded
RwA	Rowena clay loam, 0 to 1 percent slopes
RwB	Rowena clay loam, 1 to 3 percent slopes
SaC	Sarita loamy fine sand, 1 to 5 percent slopes
SoE	Somervell-Stony land complex, moderately steep
SpB	Speck clay loam, 1 to 3 percent slopes
ToA	Tobosa clay, 0 to 1 percent slopes
ToB	Tobosa clay, 1 to 3 percent slopes
VcB	Valera clay, 1 to 3 percent slopes
WeB	Weymouth loam, 1 to 3 percent slopes
WpB	Weymouth-Portales complex, 1 to 3 percent slopes
WtA	Winters fine sandy loam, 0 to 1 percent slopes
WtB	Winters fine sandy loam, 1 to 3 percent slopes
Ya	Yahola fine sandy loam

LOW INTENSITY *

SYMBOL	NAME
BA	Badland
BNB	Bonti soils, undulating
BWB	Bonti and Owens soils, undulating
KAB	Kavett and Talpa soils, undulating
KMB	Kimbrough and Mereta soils, undulating
POB	Purves and Owens soils, undulating
SRB	Speck and Tarrant soils, undulating
STE	Stony land and Owens soils, moderately steep
TAB	Tarrant soils, undulating
TPB	Tarrant and Purves soils, undulating
WMB	Weymouth and Menard soils, undulating
YCD	Yahola and Clairemont soils, strongly sloping

* The composition of these units is more variable than that of the others in the County, but has been controlled well enough to interpret for the expected use of the soils.

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Divided
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Buildings
- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches

Lakes and ponds
- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments
- Bedrock
- Other

Short steep slope

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness: Stony; Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit or a range site, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Acreage and extent, table 1, page 6.
Predicted yields, table 2, page 36.

Engineering uses of the soils, tables 3, 4, and 5, pages 42 through 59.

MEDIUM INTENSITY

Map symbol	Mapping unit	Page	Capability unit: Symbol	Capability unit: Page	Range site: Name	Range site: Page
AbA	Abilene clay loam, 0 to 1 percent slopes	7	IIc-3	34	Deep Upland	38
AbB	Abilene clay loam, 1 to 3 percent slopes	7	IIe-2	33	Deep Upland	38
BoB	Bonti fine sandy loam, 1 to 3 percent slopes	8	IIIe-6	35	Sandy Loam	38
CaB	Callahan loam, 1 to 3 percent slopes	9	IIe-2	33	Deep Upland	38
CcB	Callahan clay loam, 1 to 3 percent slopes	9	IIe-2	33	Deep Upland	38
Cm	Clairemont silt loam	10	IIc-2	34	Bottomland	38
Cn	Clairemont silty clay loam, clayey variant	10	Vw-1	35	Bottomland	38
Fo	Frio clay loam	11	IIc-2	34	Bottomland	38
Fr	Frio clay loam, frequently flooded	11	Vw-1	35	Bottomland	38
HgB	Hilgrave gravelly loam, clayey variant, 1 to 3 percent slopes	12	IVs-1	35	Tight Sandy Loam	39
KvB	Kavett silty clay, 1 to 3 percent slopes	12	IIIe-3	34	Shallow	39
KwB	Krum clay loam, 1 to 3 percent slopes	14	IIe-3	33	Deep Upland	38
KwC	Krum clay loam, 3 to 5 percent slopes	15	IIIe-4	34	Deep Upland	38
LdA	Lindy clay loam, 0 to 1 percent slopes	15	IIc-5	34	Deep Upland	38
LdB	Lindy clay loam, 1 to 3 percent slopes	16	IIe-2	33	Deep Upland	38
MeB	Menard fine sandy loam, 1 to 3 percent slopes	16	IIe-1	33	Sandy Loam	38
MeC2	Menard fine sandy loam, 1 to 5 percent slopes, eroded	16	IIIe-5	34	Sandy Loam	38
MmC2	Menard-Weymouth complex, 1 to 5 percent slopes, eroded	16				
	Menard part	--	IIIe-5	34	Sandy Loam	38
	Weymouth part	--	IIIe-5	34	Shallow	39
MrB	Mereta clay loam, 1 to 3 percent slopes	17	IIIe-3	34	Shallow	39
MsB	Miles fine sandy loam, 1 to 3 percent slopes	18	IIe-1	33	Sandy Loam	38
NuA	Nuvalde clay loam, 0 to 1 percent slopes	18	IIc-4	34	Deep Upland	38
NuB	Nuvalde clay loam, 1 to 3 percent slopes	18	IIe-3	33	Deep Upland	38
OcA	Olton clay loam, 0 to 1 percent slopes	19	IIc-3	34	Deep Upland	38
OcB	Olton clay loam, 1 to 3 percent slopes	19	IIe-2	33	Deep Upland	38
OwB	Owens clay, 1 to 3 percent slopes	20	IVe-1	35	Shallow	39
PdB	Pedernales loamy fine sand, 1 to 3 percent slopes	20	IIIe-1	34	Tight Sandy Loam	39
PeB	Pedernales fine sandy loam, 1 to 3 percent slopes	21	IIIe-6	35	Tight Sandy Loam	39
PeB2	Pedernales fine sandy loam, 1 to 3 percent slopes, eroded	21	IIIe-5	34	Tight Sandy Loam	39
RwA	Rowena clay loam, 0 to 1 percent slopes	22	IIs-1	33	Deep Upland	38
RwB	Rowena clay loam, 1 to 3 percent slopes	22	IIe-3	33	Deep Upland	38
SaC	Sarita loamy fine sand, 1 to 5 percent slopes	23	IVe-2	35	Deep Sand	39
SoE	Somervell-Stony land complex, moderately steep	23				
	Somervell part	--	VIIs-1	35	Steep Adobe	40
	Stony land part	--	VIIs-1	35	Rocky Hills	40
SpB	Speck clay loam, 1 to 3 percent slopes	24	IIIe-3	34	Redland	38
ToA	Tobosa clay, 0 to 1 percent slopes	26	IIs-1	33	Deep Upland	38
ToB	Tobosa clay, 1 to 3 percent slopes	27	IIIe-2	34	Deep Upland	38
VcB	Valera clay, 1 to 3 percent slopes	27	IIe-3	33	Deep Upland	38
WeB	Weymouth loam, 1 to 3 percent slopes	28	IIe-4	33	Shallow	39
WpB	Weymouth-Portales complex, 1 to 3 percent slopes	28				
	Weymouth part	--	IIe-4	33	Shallow	39
	Portales part	--	IIe-4	33	Deep Upland	38
WtA	Winters fine sandy loam, 0 to 1 percent slopes	29	IIc-6	34	Tight Sandy Loam	39
WtB	Winters fine sandy loam, 1 to 3 percent slopes	29	IIIe-6	35	Tight Sandy Loam	39
Ya	Yahola fine sandy loam	29	IIc-1	34	Bottomland	38

LOW INTENSITY

Map symbol	Mapping unit	Page	Capability unit: Symbol	Capability unit: Page	Range site: Name	Range site: Page
BA	Badland	7	VIIIs-1	35	------------------	--
BNB	Bonti soils, undulating	8	VIe-3	35	Sandstone Hills	39
BWB	Bonti and Owens soils, undulating	8				
	Bonti part	--	VIe-3	35	Sandstone Hills	39
	Owens part	--	VIe-3	35	Shaly Hills	41
KAB	Kavett and Talpa soils, undulating	13				
	Kavett part	--	VIe-3	35	Shallow	39
	Talpa part	--	VIe-3	35	Very Shallow	41
KMB	Kimbrough and Mereta soils, undulating	13				
	Kimbrough part	--	VIe-2	35	Very Shallow	41
	Mereta part	--	VIe-2	35	Shallow	39
POB	Purves and Owens soils, undulating	22				
	Purves part	--	VIe-3	35	Shallow	39
	Owens part	--	VIe-3	35	Shaly Hills	41
SRB	Speck and Tarrant soils, undulating	24				
	Speck part	--	VIe-3	35	Redland	38
	Tarrant part	--	VIe-3	35	Low Stony Hills	40
STE	Stony land and Owens soils, moderately steep	25				
	Stony land	--	VIIs-1	35	Rocky Hills	40
	Owens part	--	VIIs-1	35	Shaly Hills	41
TAB	Tarrant soils, undulating	26	VIe-3	35	Low Stony Hills	40
TPB	Tarrant and Purves soils, undulating	26				
	Tarrant part	--	VIe-3	35	Low Stony Hills	40
	Purves part	--	VIe-3	35	Shallow	39
WMB	Weymouth and Menard soils, undulating	28				
	Weymouth part	--	VIe-2	35	Shallow	39
	Menard part	--	VIe-2	35	Sandy Loam	38
YCD	Yahola and Clairemont soils, strongly sloping	29	VIe-1	35	River Breaks	39

1

(Joins sheet 2)

(Joins sheet 7)

N

Scale 1:24 000

2 Miles
10 000 Feet
1
5 000
3/4
1/2
1/4
0
1000
2000
3000
4000
5000

COLEMAN COUNTY, TEXAS NO. 1

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

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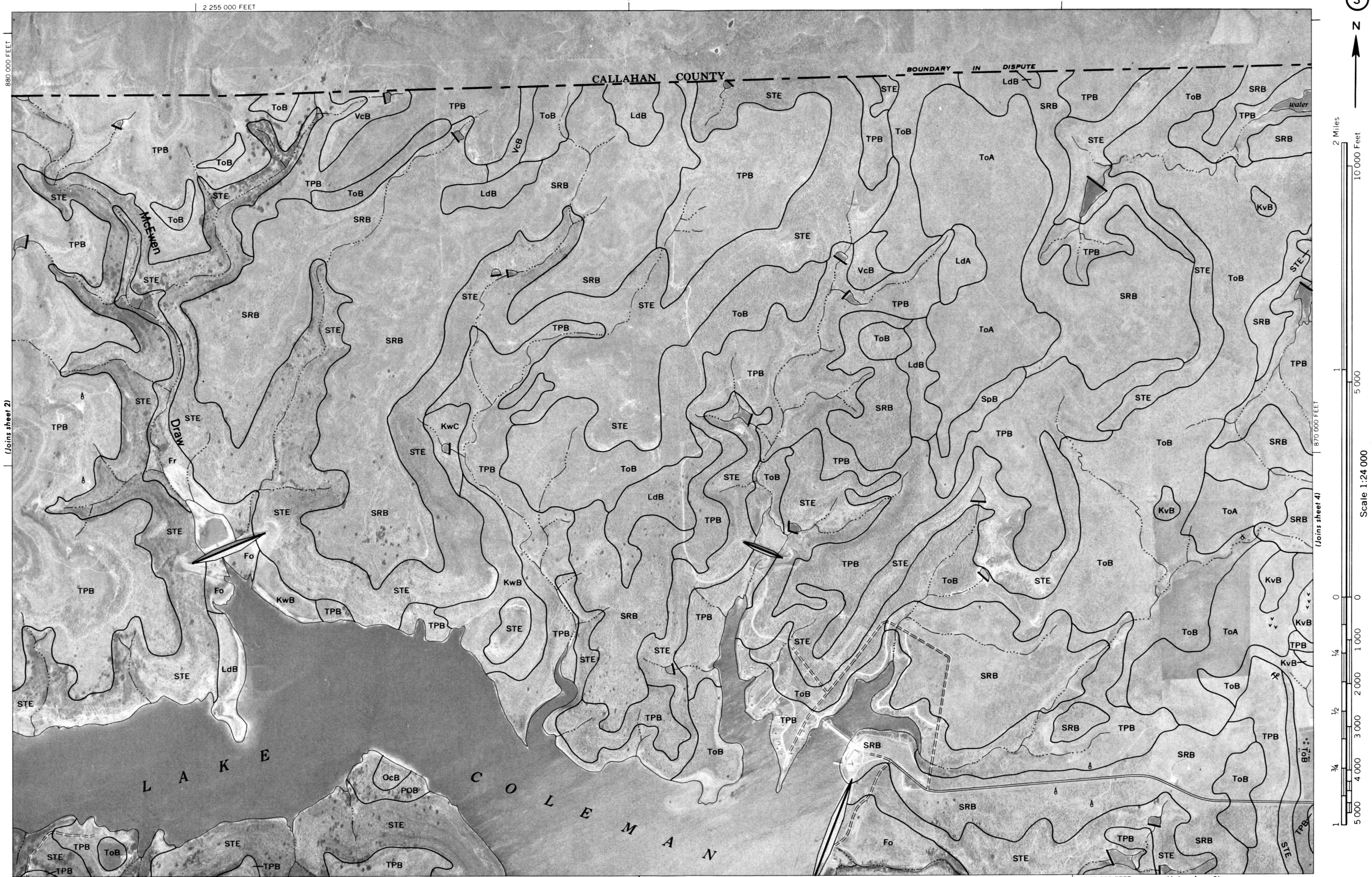


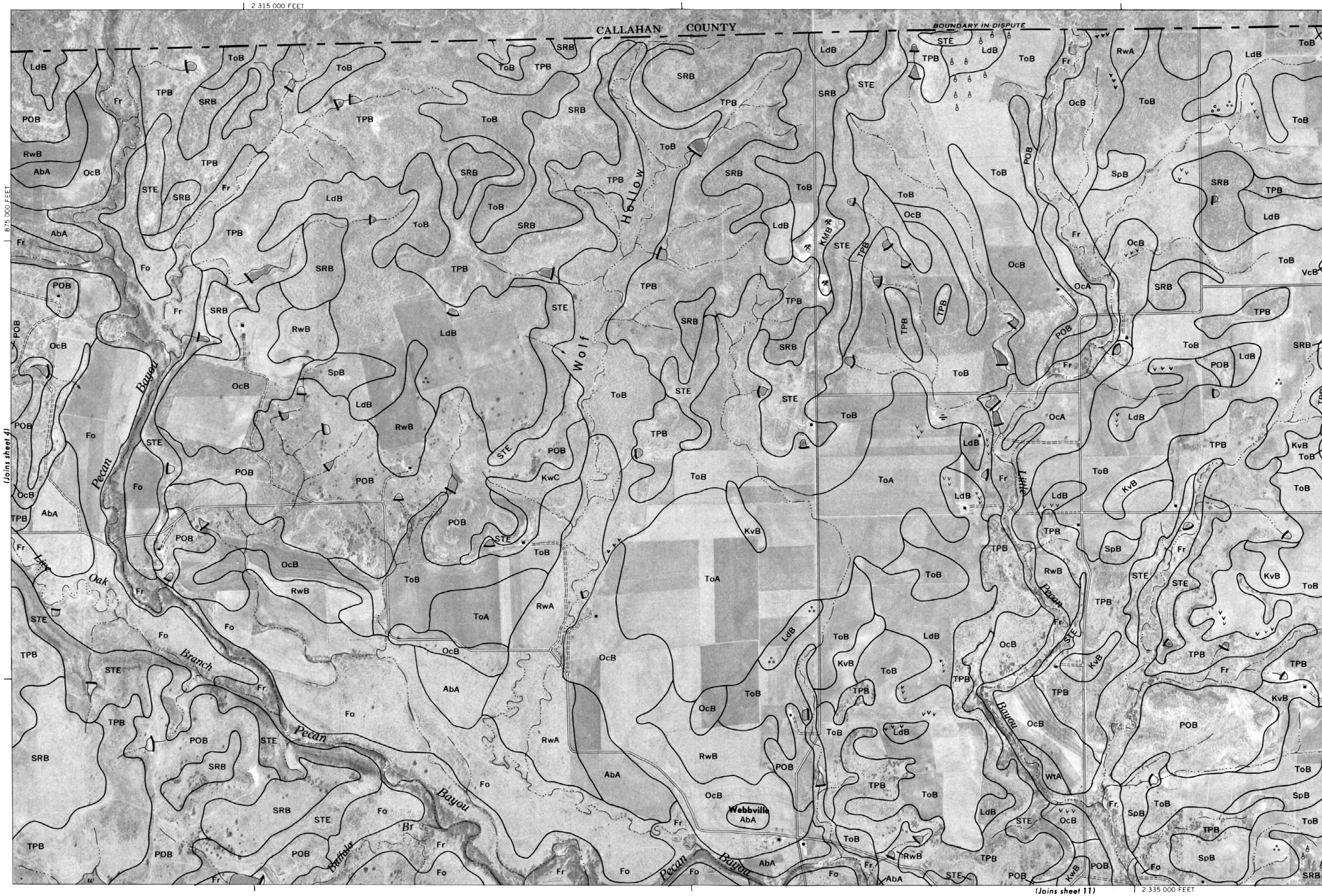
COLEMAN COUNTY, TEXAS — SHEET NUMBER 4

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 5

(5)



COLEMAN COUNTY, TEXAS NO. 5

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

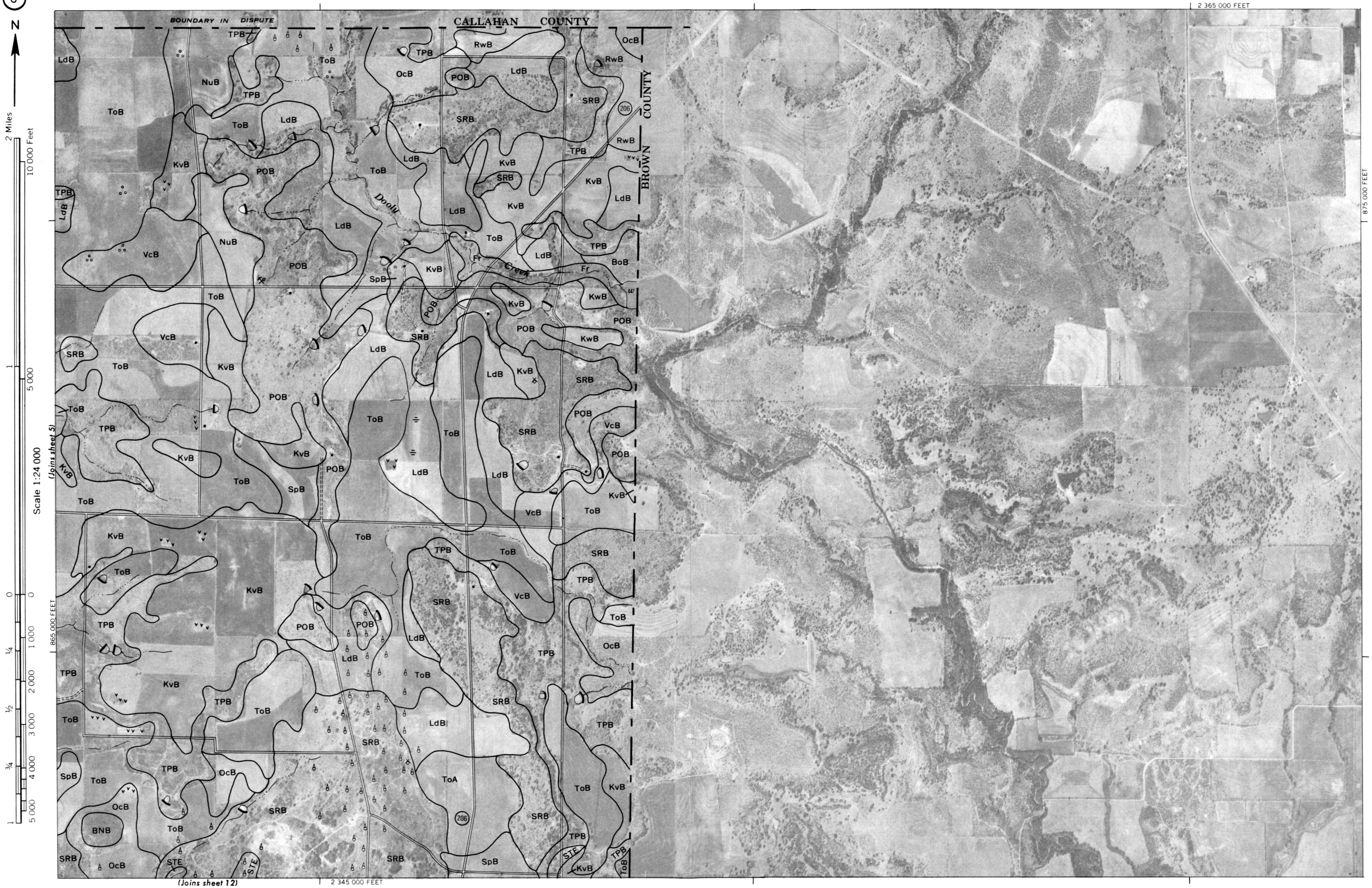
N

2 Miles
1
0
1/4
1/2
3/4
1

10 000 Feet
5 000
0
1000
2000
3000
4000
5000

Scale 1:24 000

COLEMAN COUNTY, TEXAS — SHEET NUMBER 6



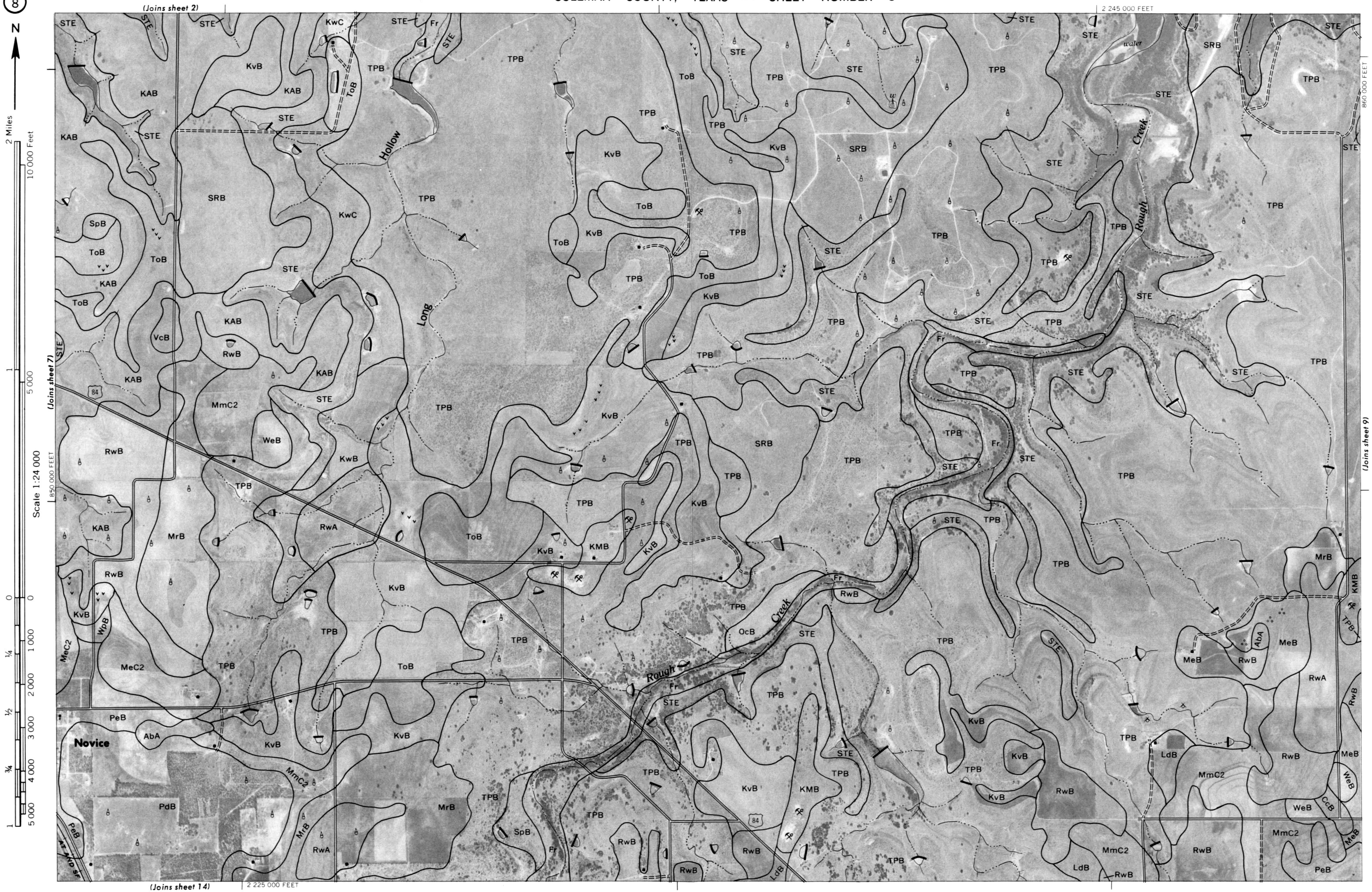
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 7

COLEMAN COUNTY, TEXAS NO. 7

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 8



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 8

COLEMAN COUNTY, TEXAS — SHEET NUMBER 9

9

COLEMAN COUNTY, TEXAS NO. 9

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 10

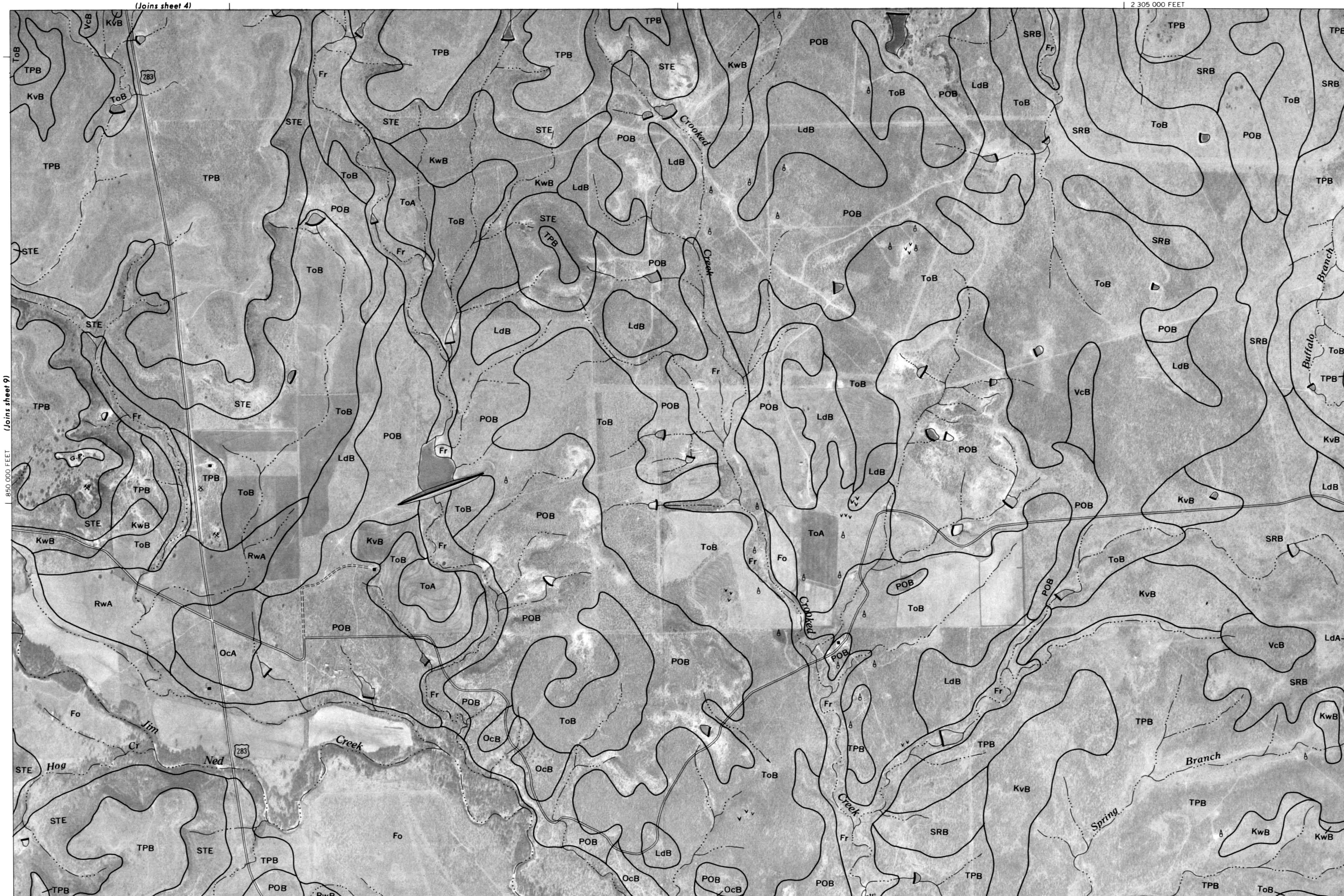
N

Scale 1:24 000

2 Miles | 1 | 0 | 1/4 | 1/2 | 3/4 | 1

10 000 Feet | 5 000 | 0 | 1 000 | 2 000 | 3 000 | 4 000 | 5 000

(Joins sheet 4)



(Joins sheet 16)

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 11

(11)

N

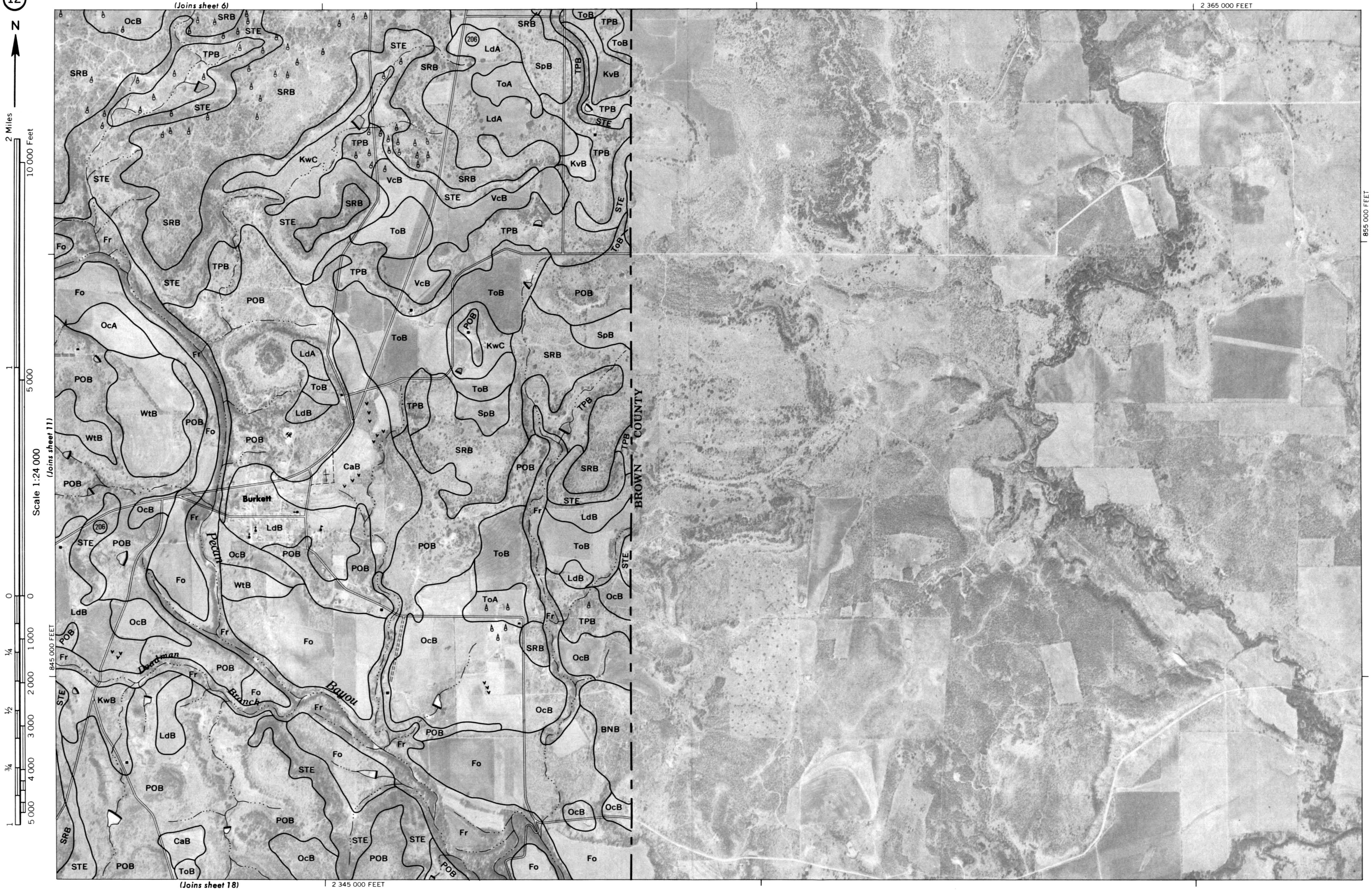
Scale 1:24 000

2 Miles
10 000 Feet
1
5 000
0 0
¼ 1000
½ 2000
¾ 3000
1 4000
5 000

COLEMAN COUNTY, TEXAS NO. 11

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 12



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 13

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

14

COLEMAN COUNTY, TEXAS — SHEET NUMBER 14

N

Scale 1:24 000

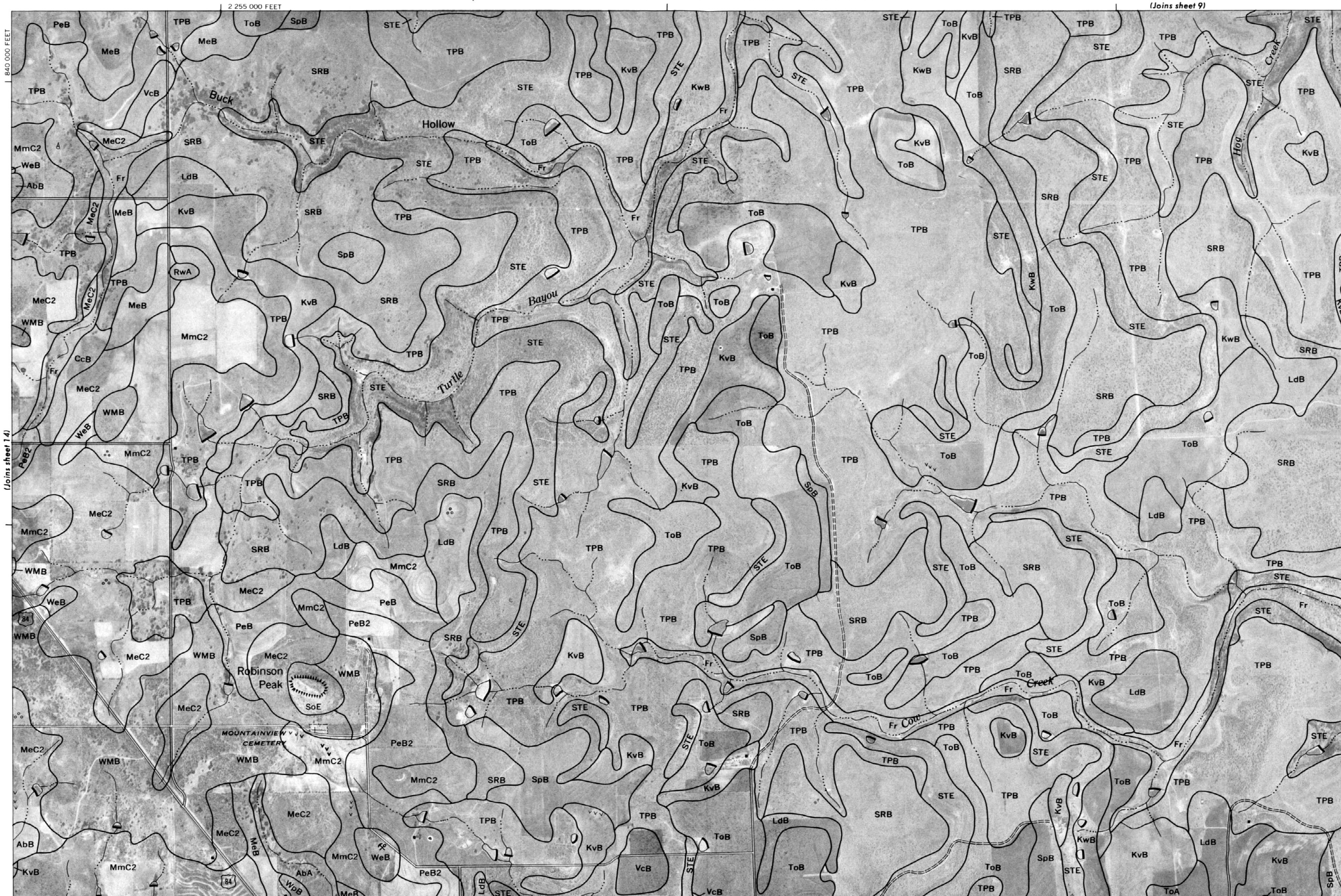
2 Miles | 1 | 0 | 1/4 | 1/2 | 3/4 | 1

10 000 Feet | 5 000 | 0 | 1 000 | 2 000 | 3 000 | 4 000 | 5 000

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 14

15



N

2 Miles
1
0
¼
½
¾
10 000 Feet
5 000
0
1000
2000
3000
4000
5000
Scale 1:24 000

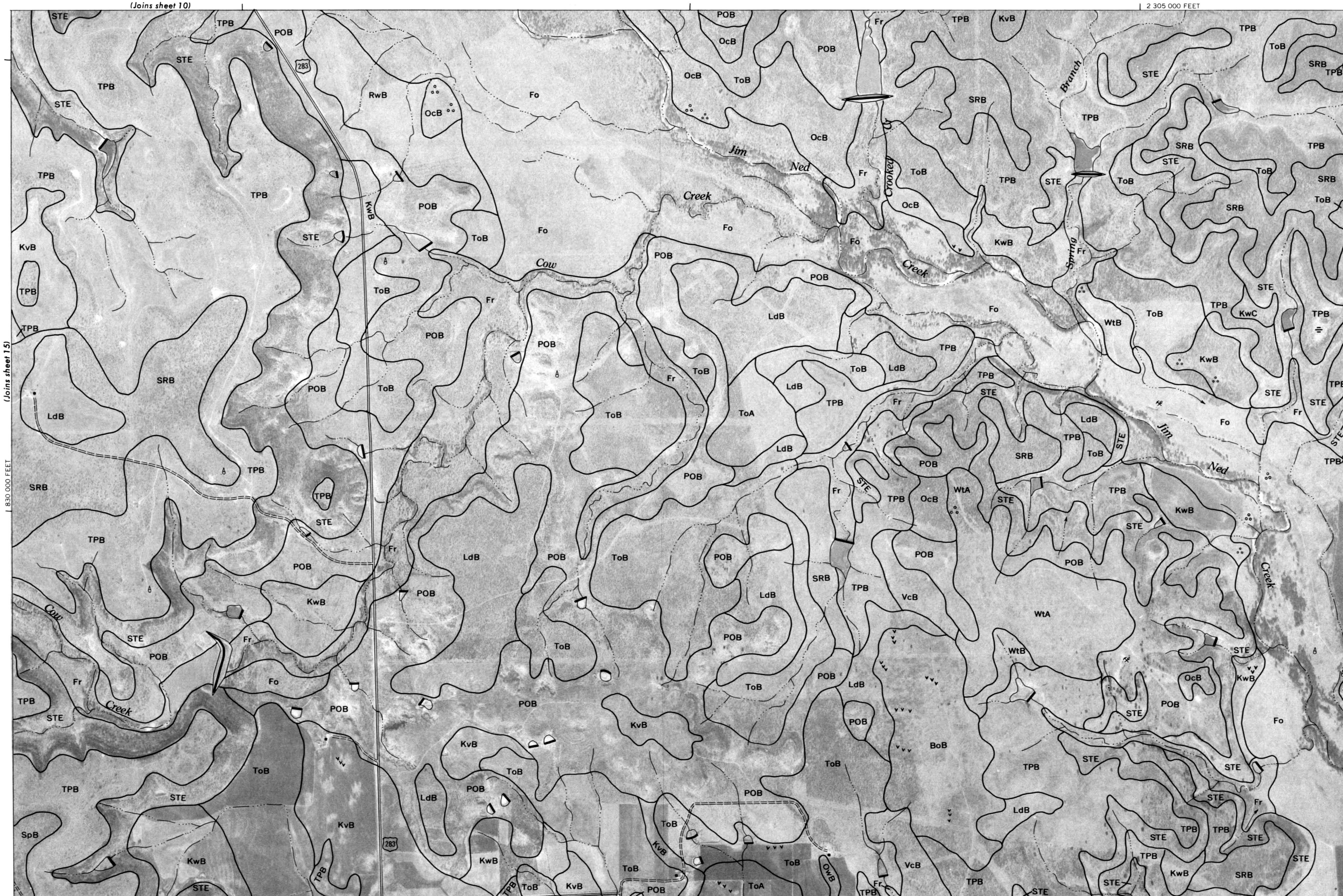
COLEMAN COUNTY, TEXAS NO. 15

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

16

COLEMAN COUNTY, TEXAS — SHEET NUMBER 16

N



Scale 1:24 000

2 Miles · 1 · ½ · ¼ · 0

10 000 Feet · 5 000 · 0 · 1 000 · 2 000 · 3 000 · 4 000 · 5 000

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 16

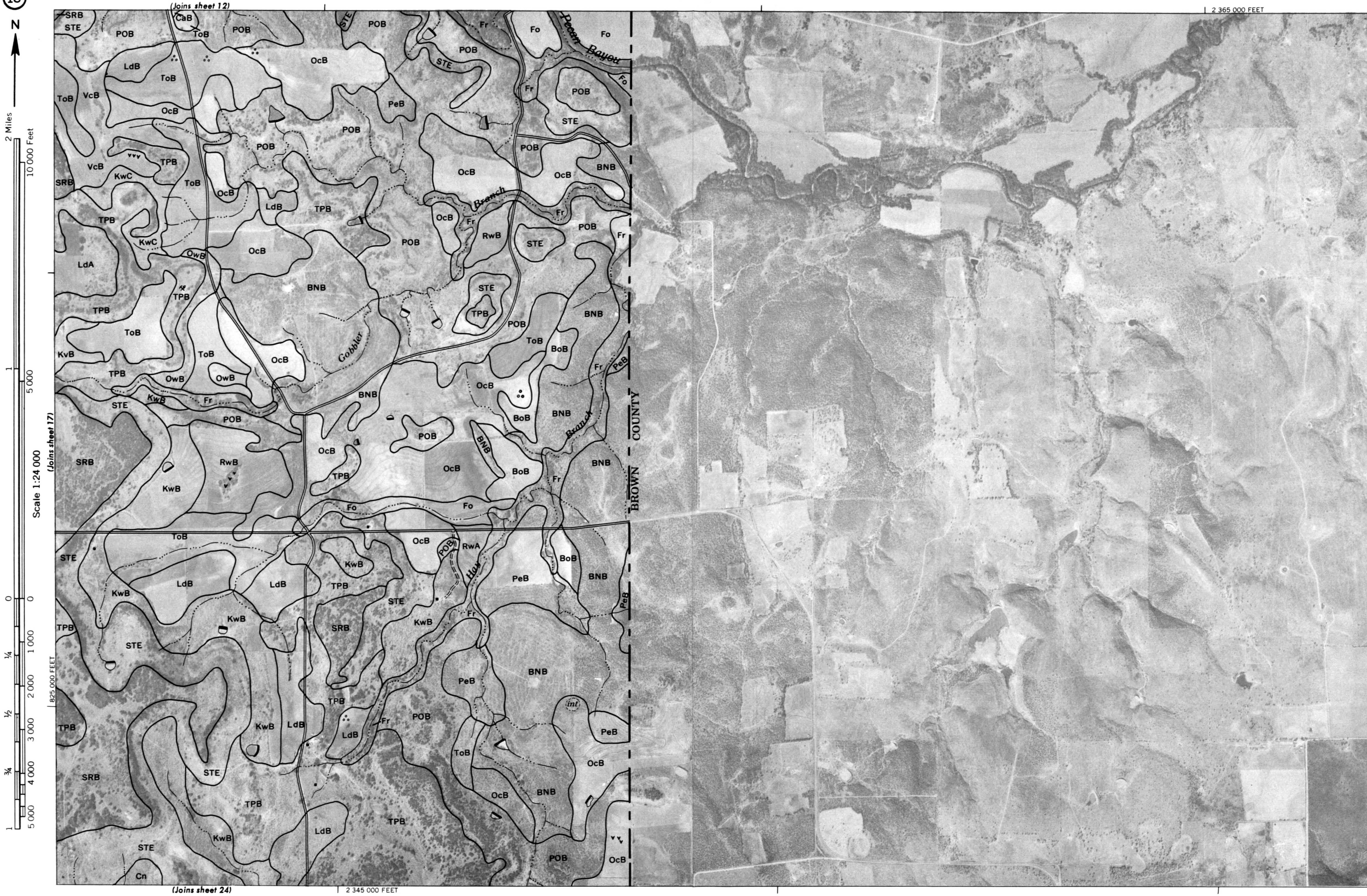
N

2 Miles
10 000 Feet
Scale 1:24 000

COLEMAN COUNTY, TEXAS NO. 17

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 18



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 19

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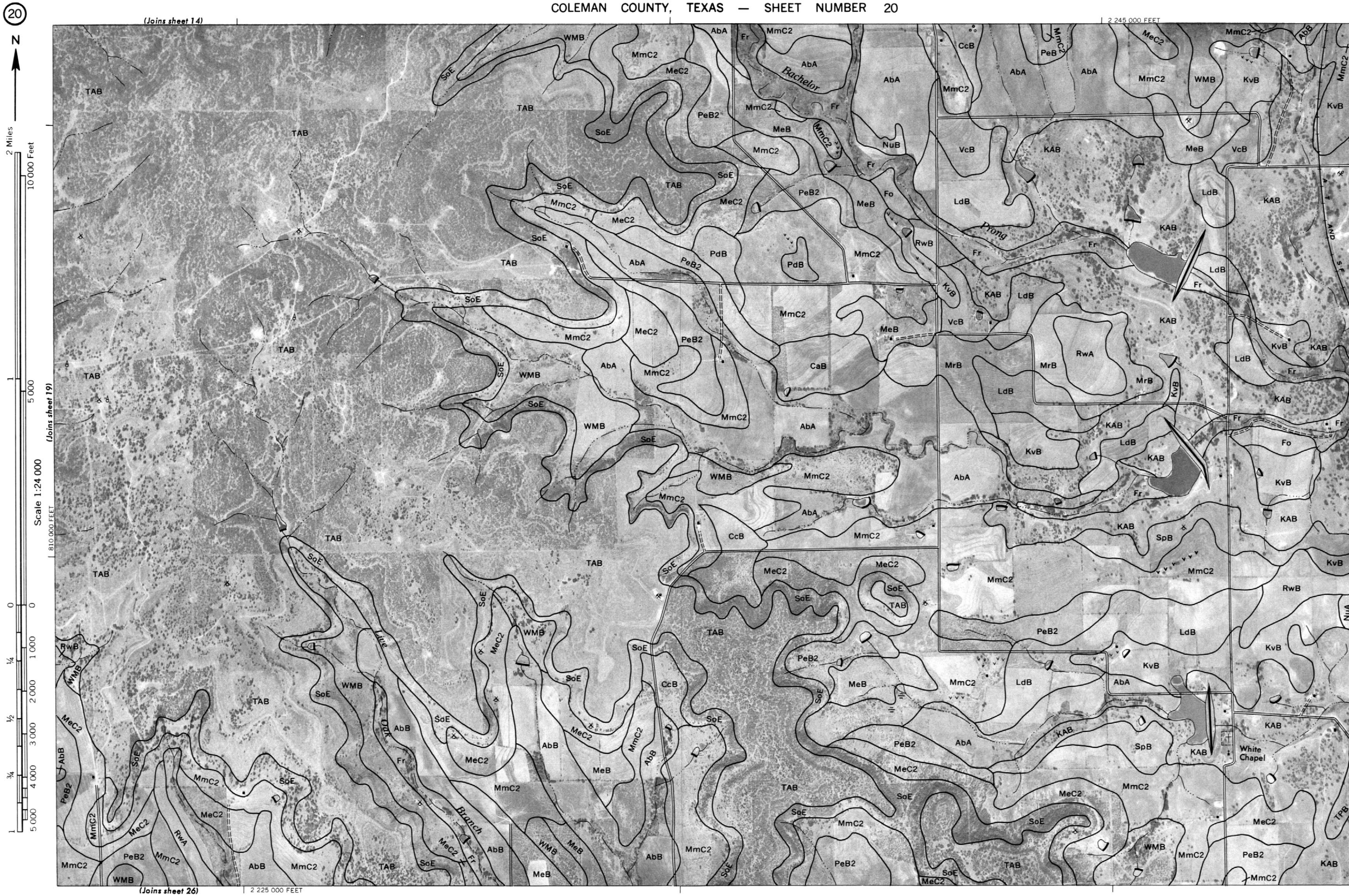
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

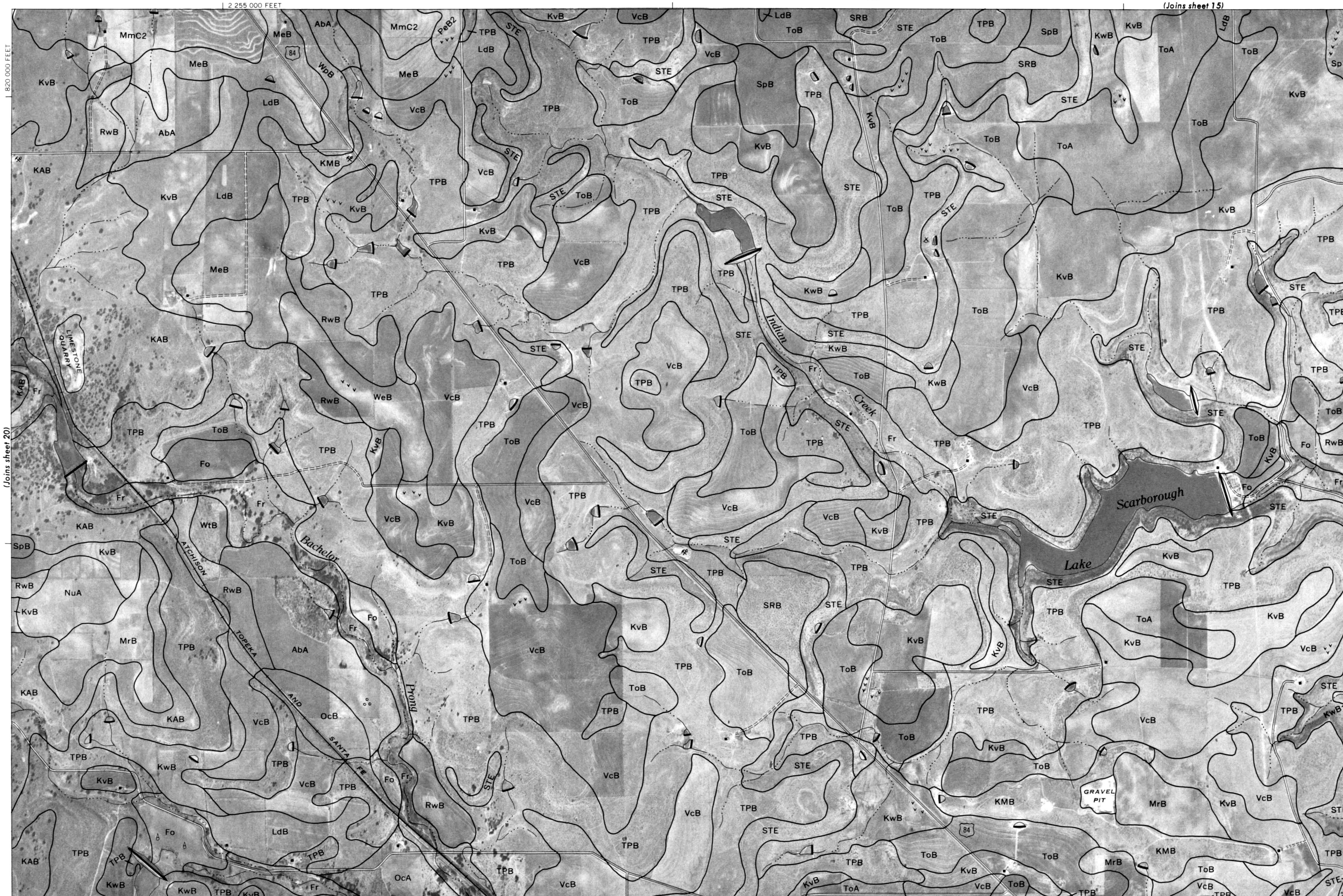


Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 21

21



N

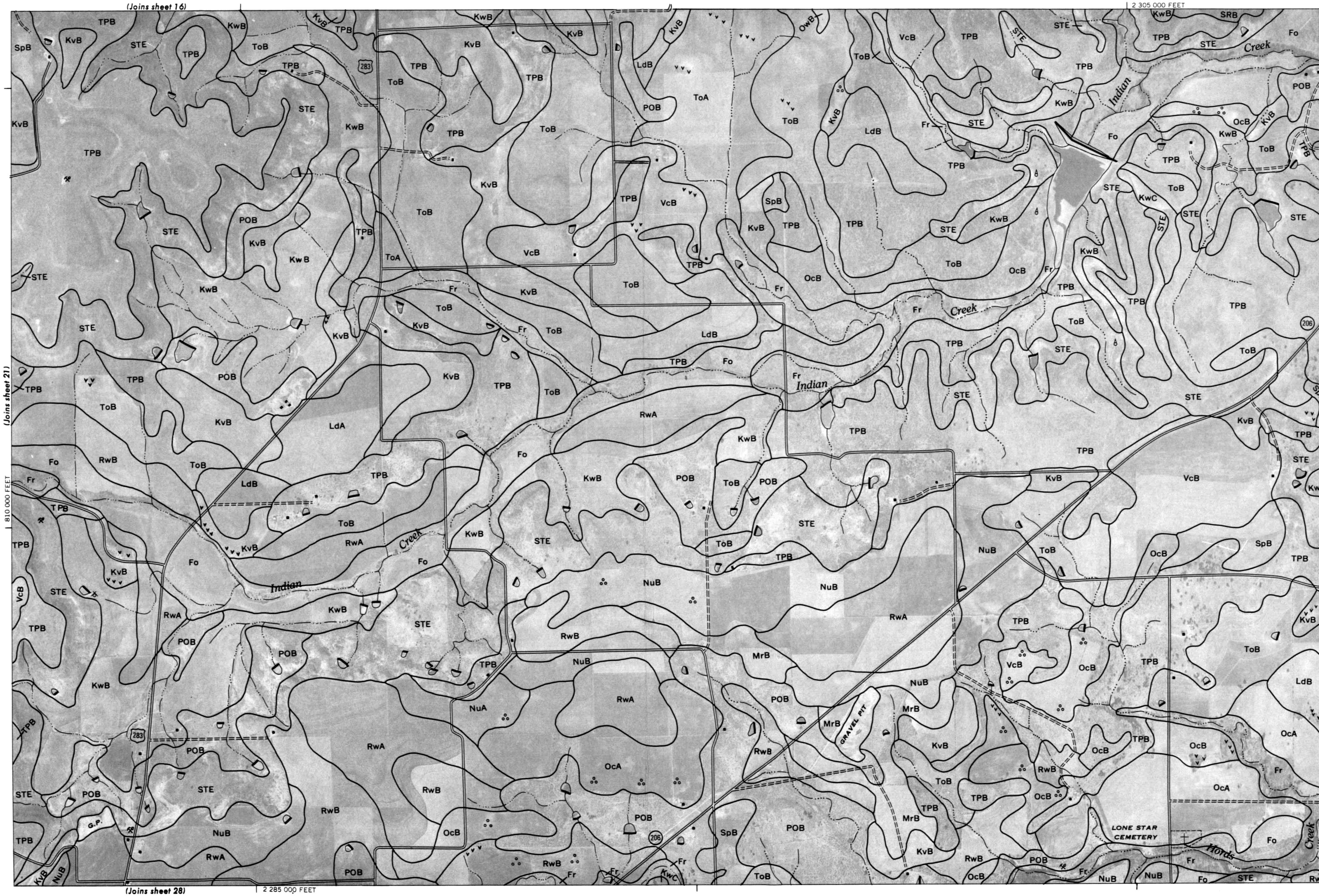
2 Miles
10 000 Feet
1
5 000
0
0
¼
1 000
2 000
½
3 000
¾
4 000
1
5 000
Scale 1:24 000

COLEMAN COUNTY, TEXAS NO. 21

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

(22)

COLEMAN COUNTY, TEXAS — SHEET NUMBER 22



N

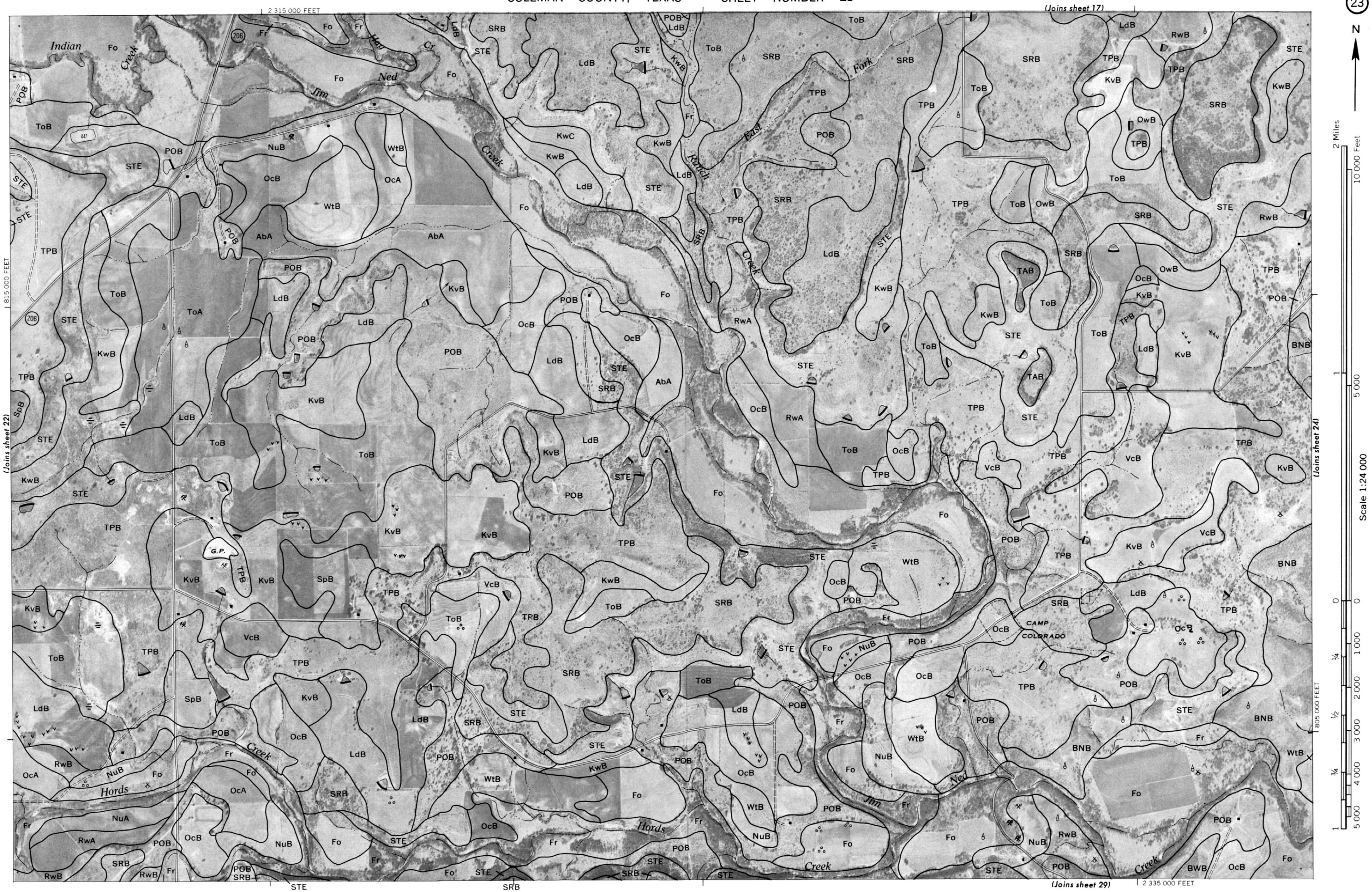
Scale 1:24 000

2 Miles

10 000 Feet

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

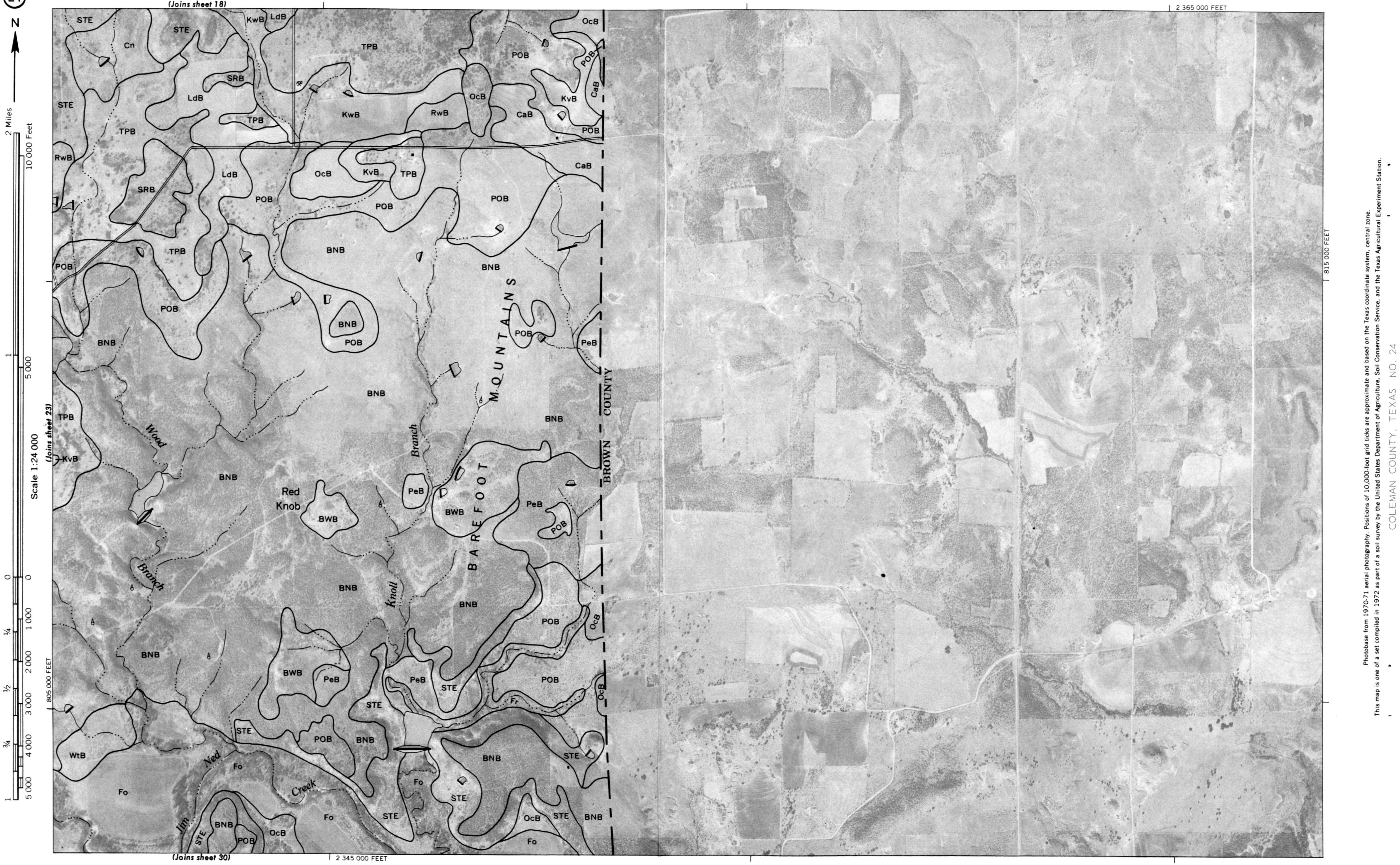
COLEMAN COUNTY, TEXAS NO. 22



COLEMAN COUNTY, TEXAS NO. 23

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 24



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

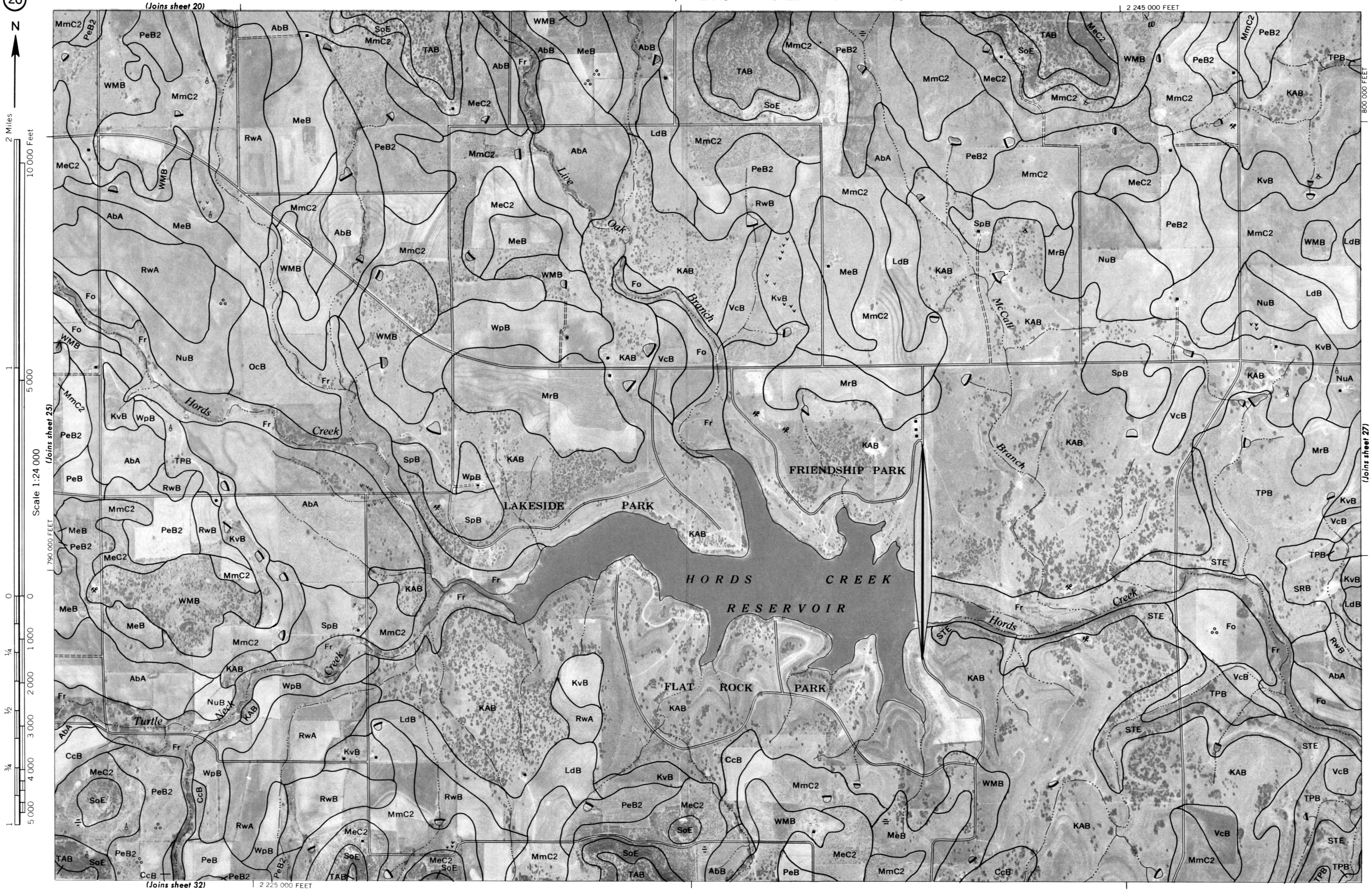
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 25

COLEMAN COUNTY, TEXAS NO. 25

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

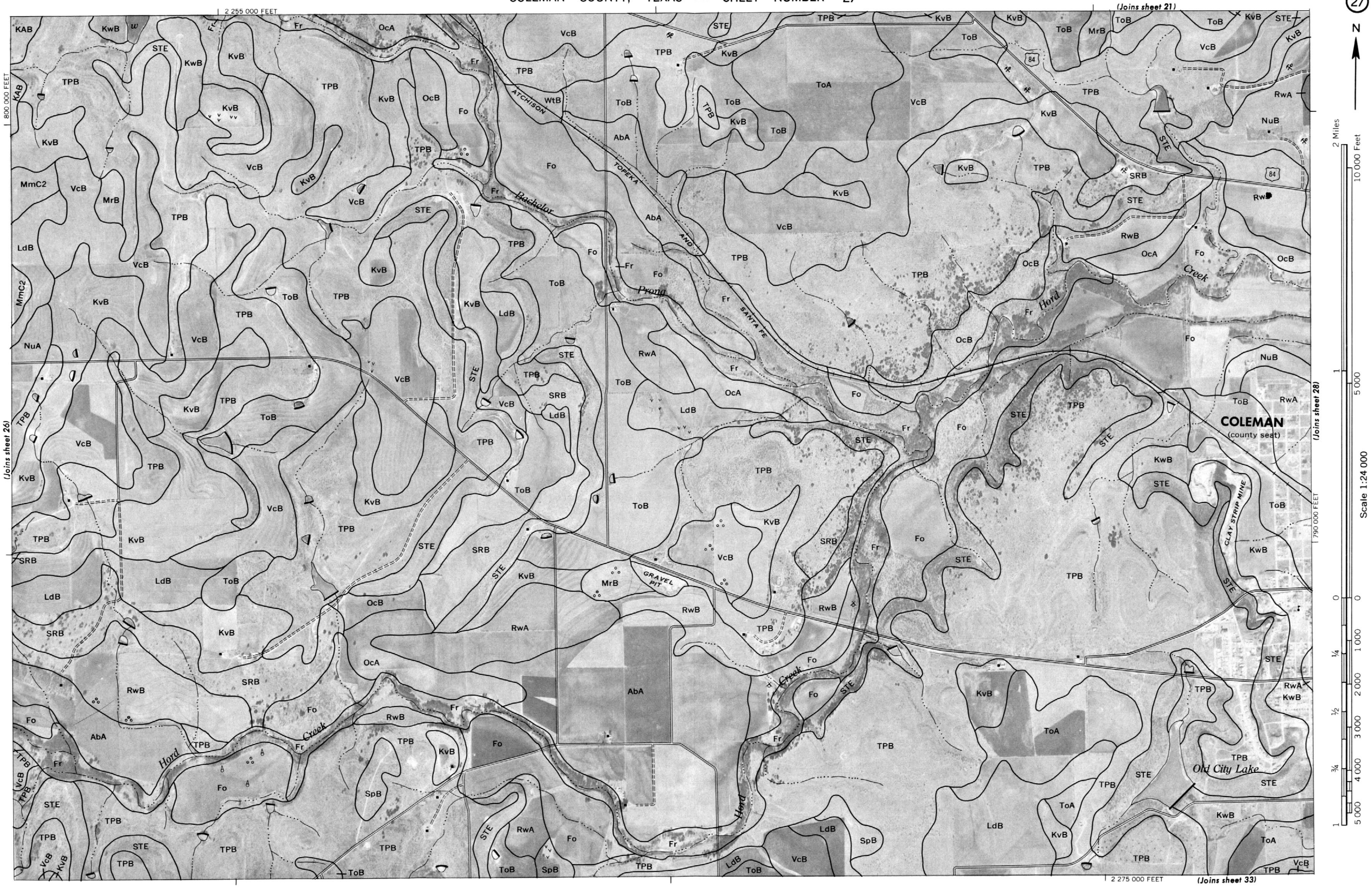
COLEMAN COUNTY, TEXAS — SHEET NUMBER 26



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 27



COLEMAN COUNTY, TEXAS NO. 27

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 28

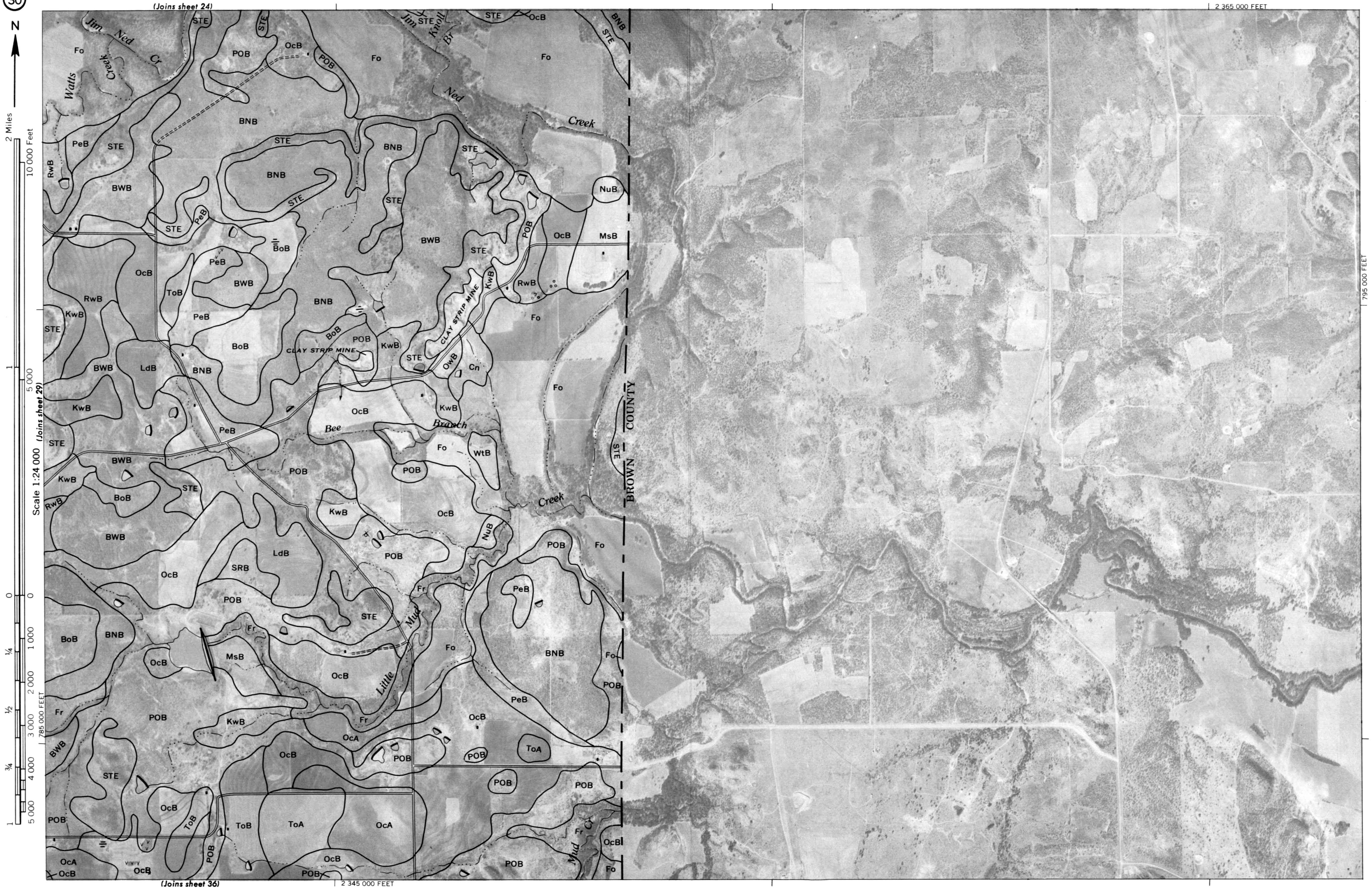
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 29

COLEMAN COUNTY, TEXAS NO. 29

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 30



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

(31)

N

Scale 1:24 000

0 ¼ ½ ¾ 1 Mile; 1 2 Miles

0 1000 2000 3000 4000 5000 10 000 Feet

COLEMAN COUNTY, TEXAS NO. 31

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 32

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 33

COLEMAN COUNTY, TEXAS NO. 33

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 34

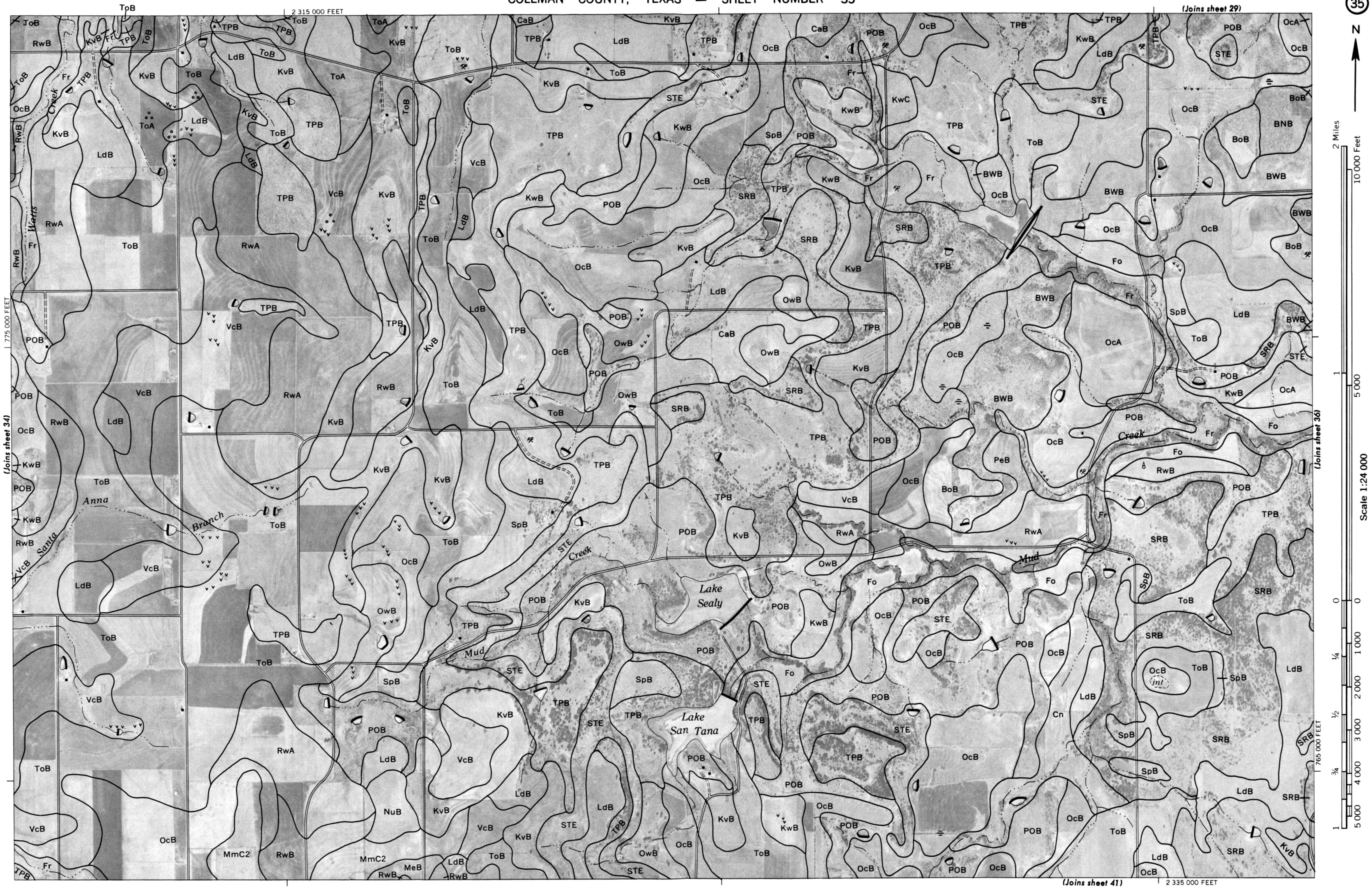
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 34

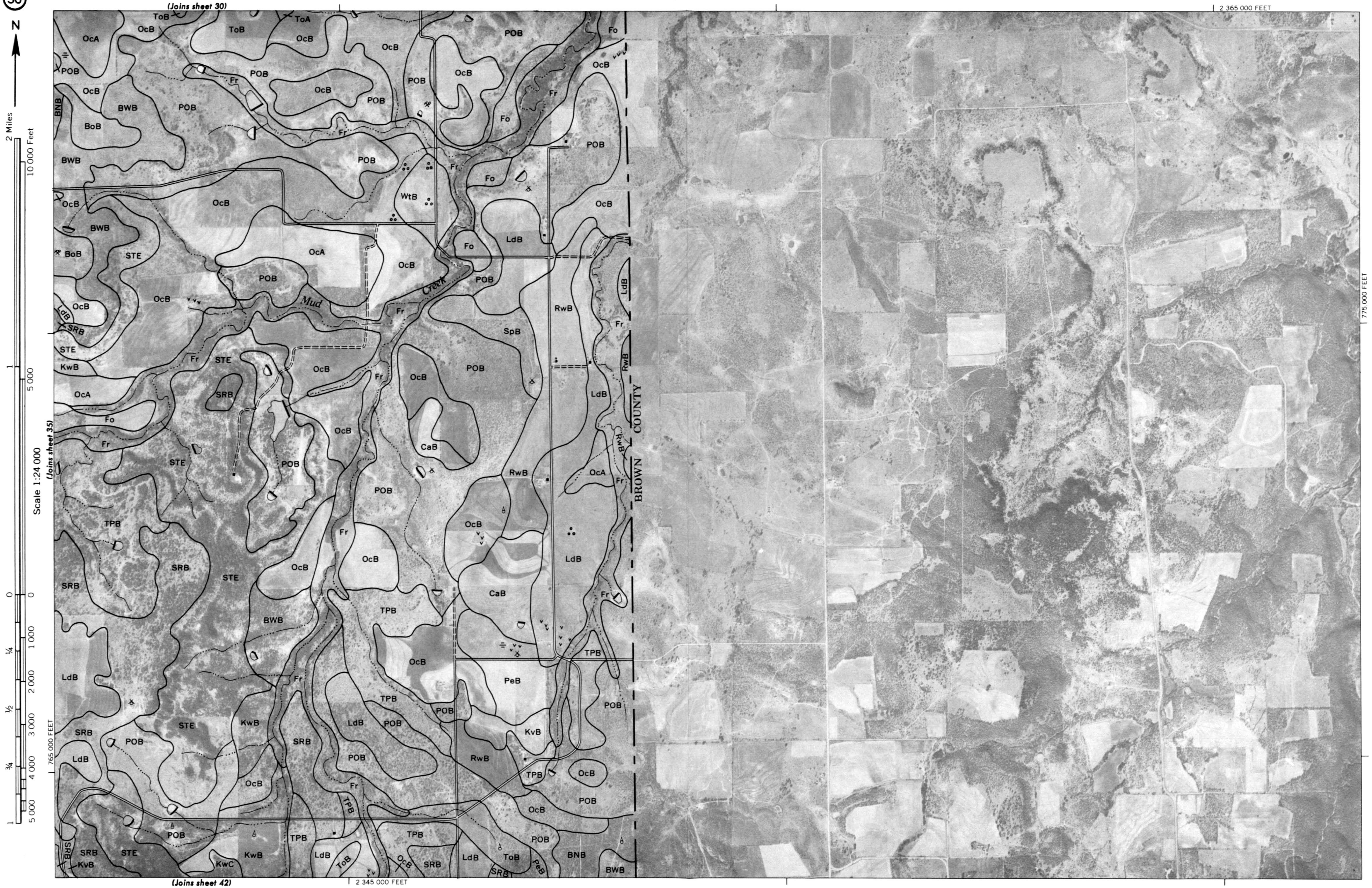
COLEMAN COUNTY, TEXAS NO. 35

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.



36

COLEMAN COUNTY, TEXAS — SHEET NUMBER 36



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 36

N

2 Miles
10 000 Feet
Scale 1:24 000
1 ¾ ½ ¼ 0
5 000 4 000 3 000 2 000 1 000 0 5 000 10 000

COLEMAN COUNTY, TEXAS NO. 37

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 38

(Joins sheet 32)

N

(Joins sheet 37)

(Joins sheet 39)

(Joins sheet 44)

2 Miles
1
0
¼
½
¾
1

10 000 Feet
5 000
0
1 000
2 000
3 000
4 000
5 000

Scale 1:24 000

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

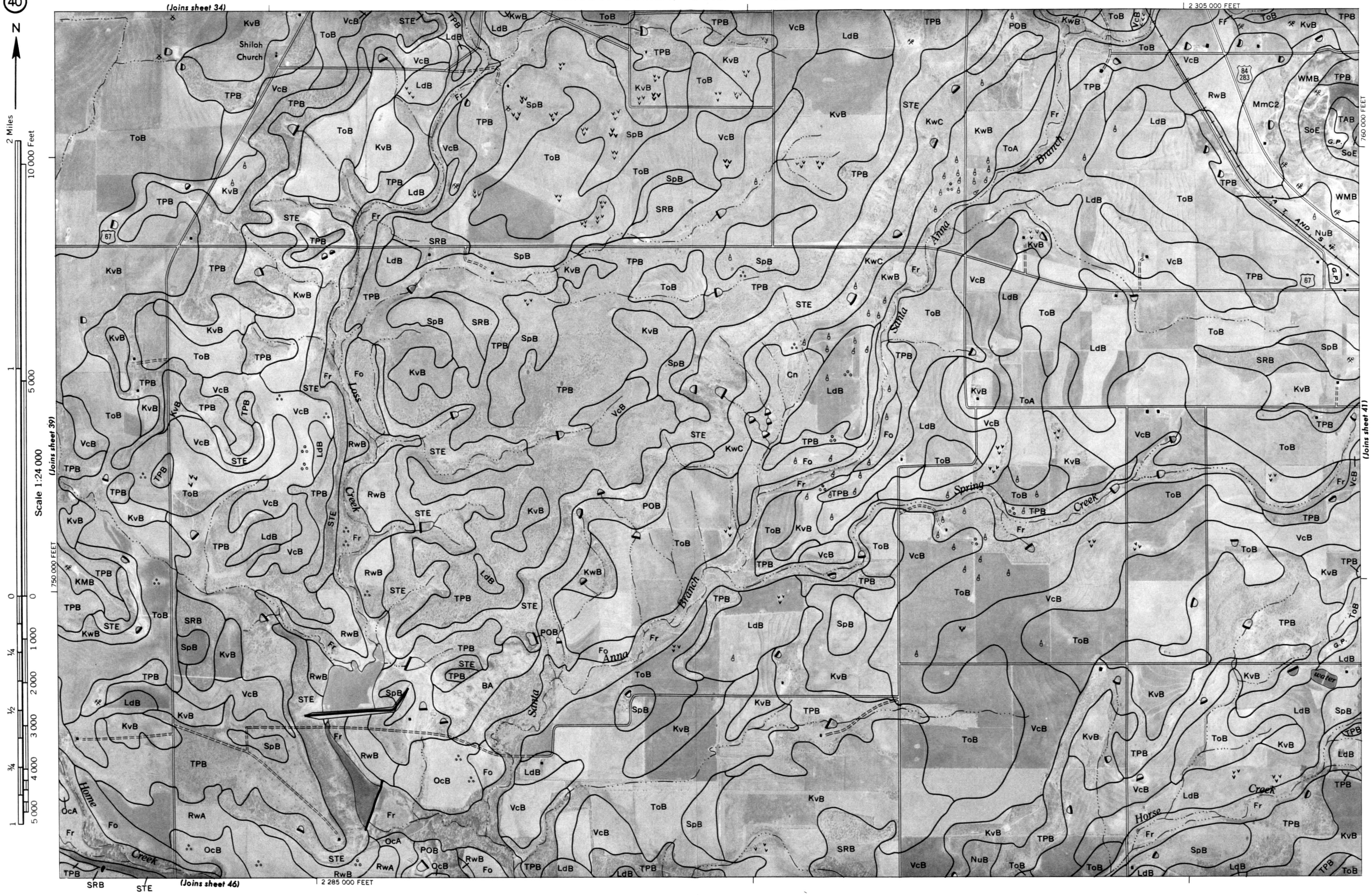
COLEMAN COUNTY, TEXAS NO. 38

COLEMAN COUNTY, TEXAS NO. 39

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

40

COLEMAN COUNTY, TEXAS — SHEET NUMBER 40



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 40

41

N

COLEMAN COUNTY, TEXAS NO. 41

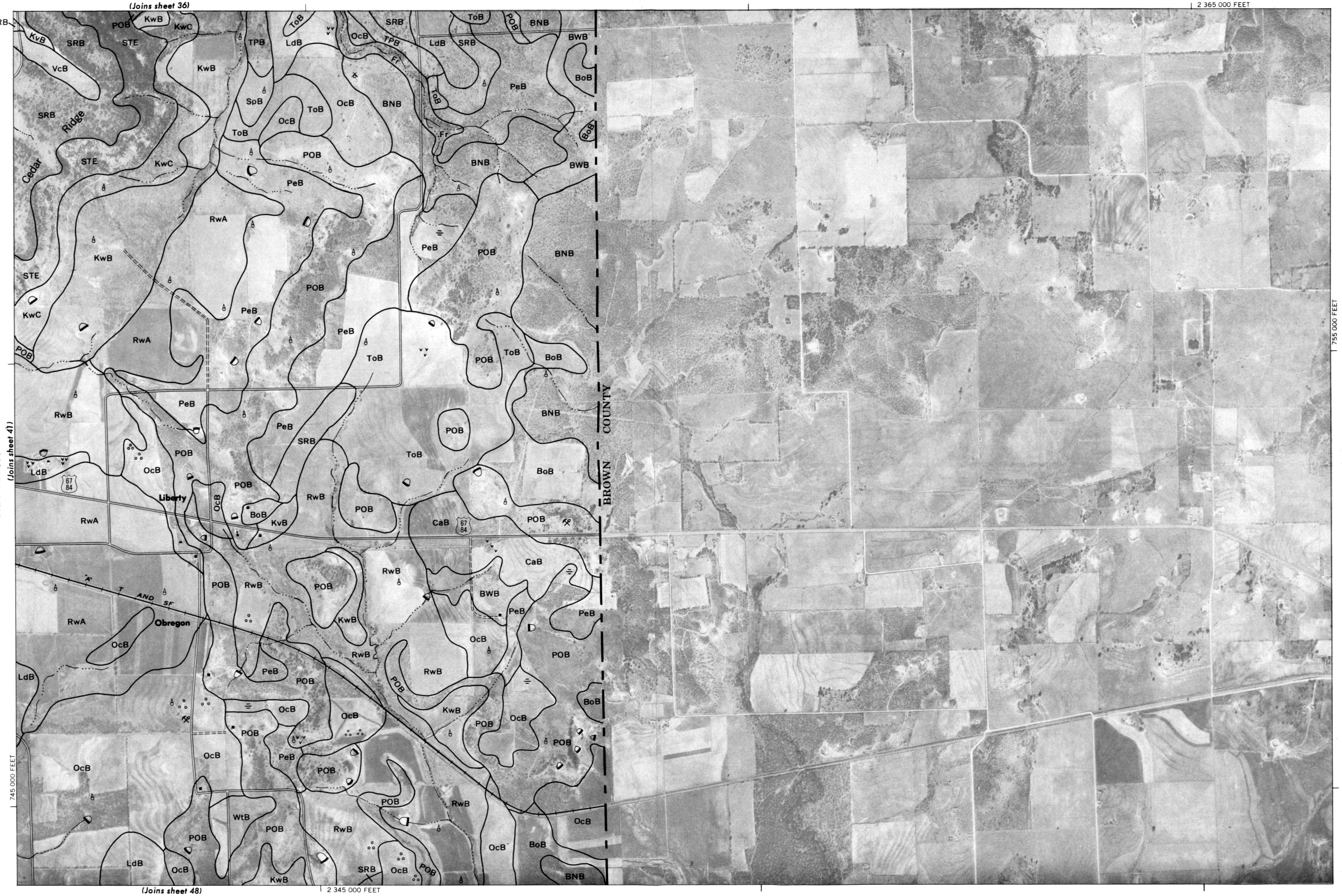
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

Scale 1:24 000

1 ¾ ½ ¼ 0 1 2 Miles

5000 4000 3000 2000 1000 0 5000 10 000 Feet

COLEMAN COUNTY, TEXAS — SHEET NUMBER 42



Scale 1:24 000

2 Miles — 1 — 0 — ¼ — ½ — ¾ — 1

10 000 Feet — 5 000 — 0 — 1000 — 2000 — 3000 — 4000 — 5 000

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

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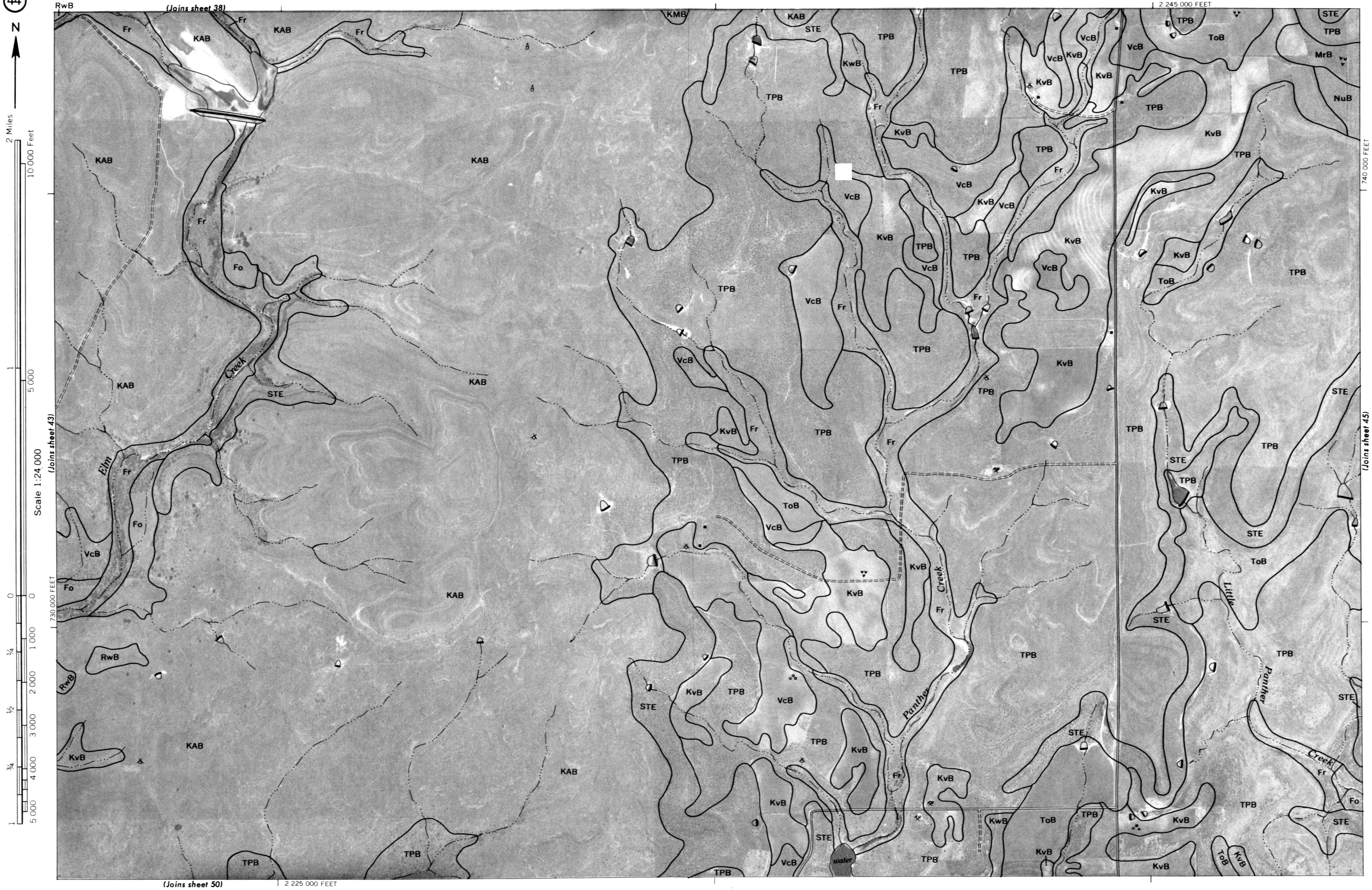
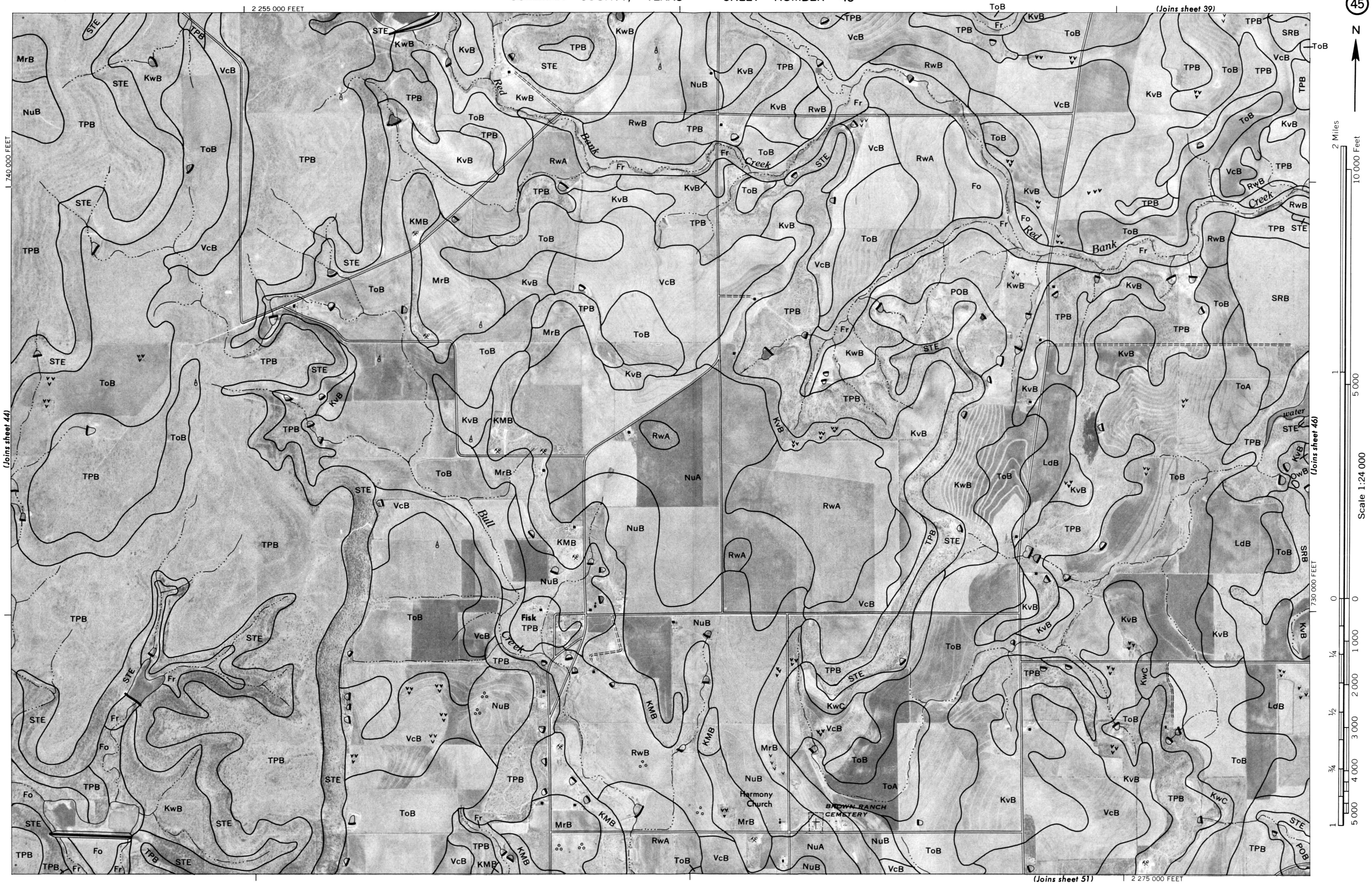


Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.



COLEMAN COUNTY, TEXAS NO. 45

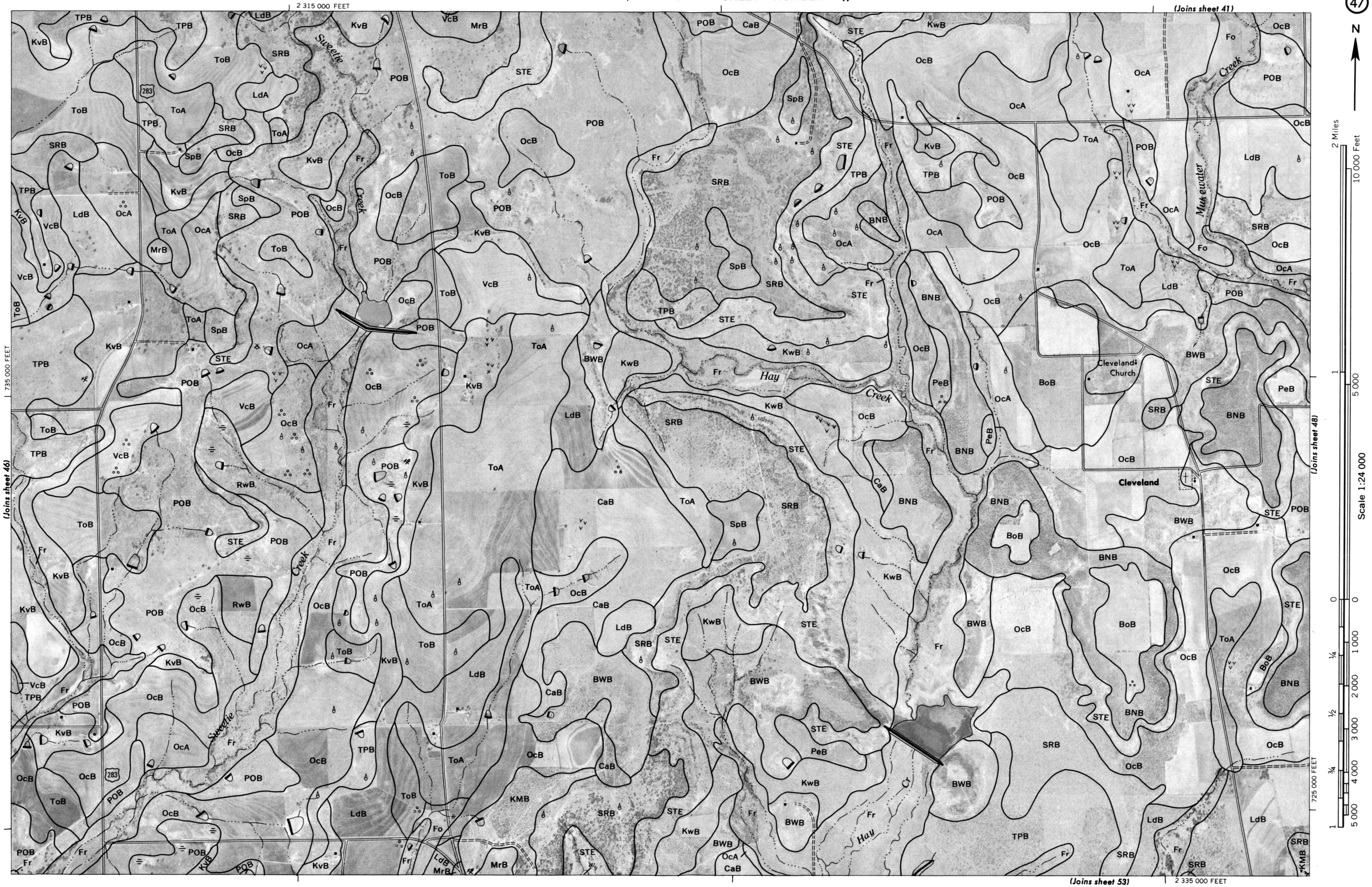
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

(46)

COLEMAN COUNTY, TEXAS — SHEET NUMBER 46

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 46



COLEMAN COUNTY, TEXAS NO. 47

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

48

COLEMAN COUNTY, TEXAS — SHEET NUMBER 48

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 48

COLEMAN COUNTY, TEXAS — SHEET NUMBER 49

COLEMAN COUNTY, TEXAS NO. 49

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

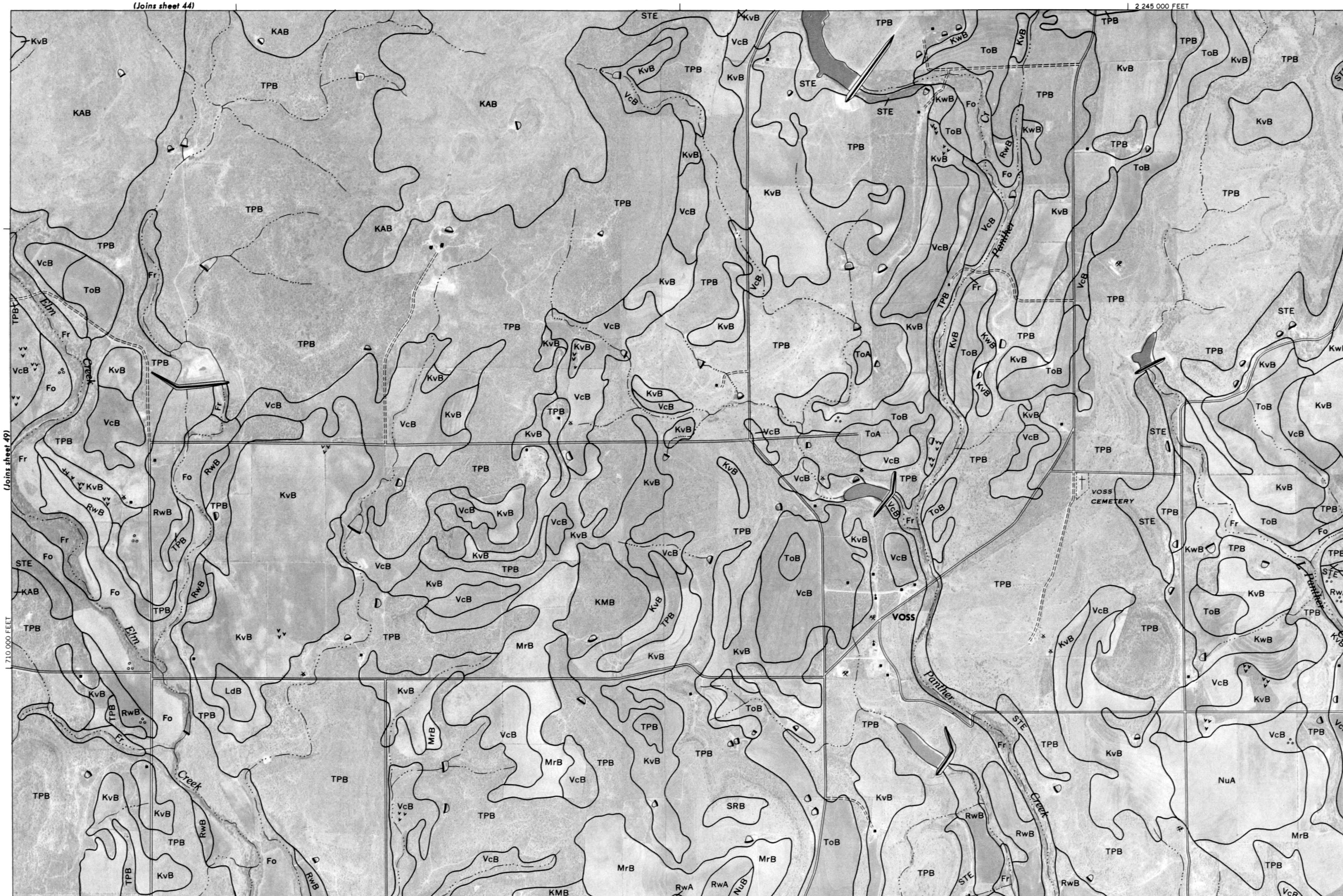
COLEMAN COUNTY, TEXAS — SHEET NUMBER 50

N

Scale 1:24 000

2 Miles | 1 | 0 — ¼ — ½ — ¾ — 1

10 000 Feet | 5 000 | 0 — 1000 — 2000 — 3000 — 4000 — 5000



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

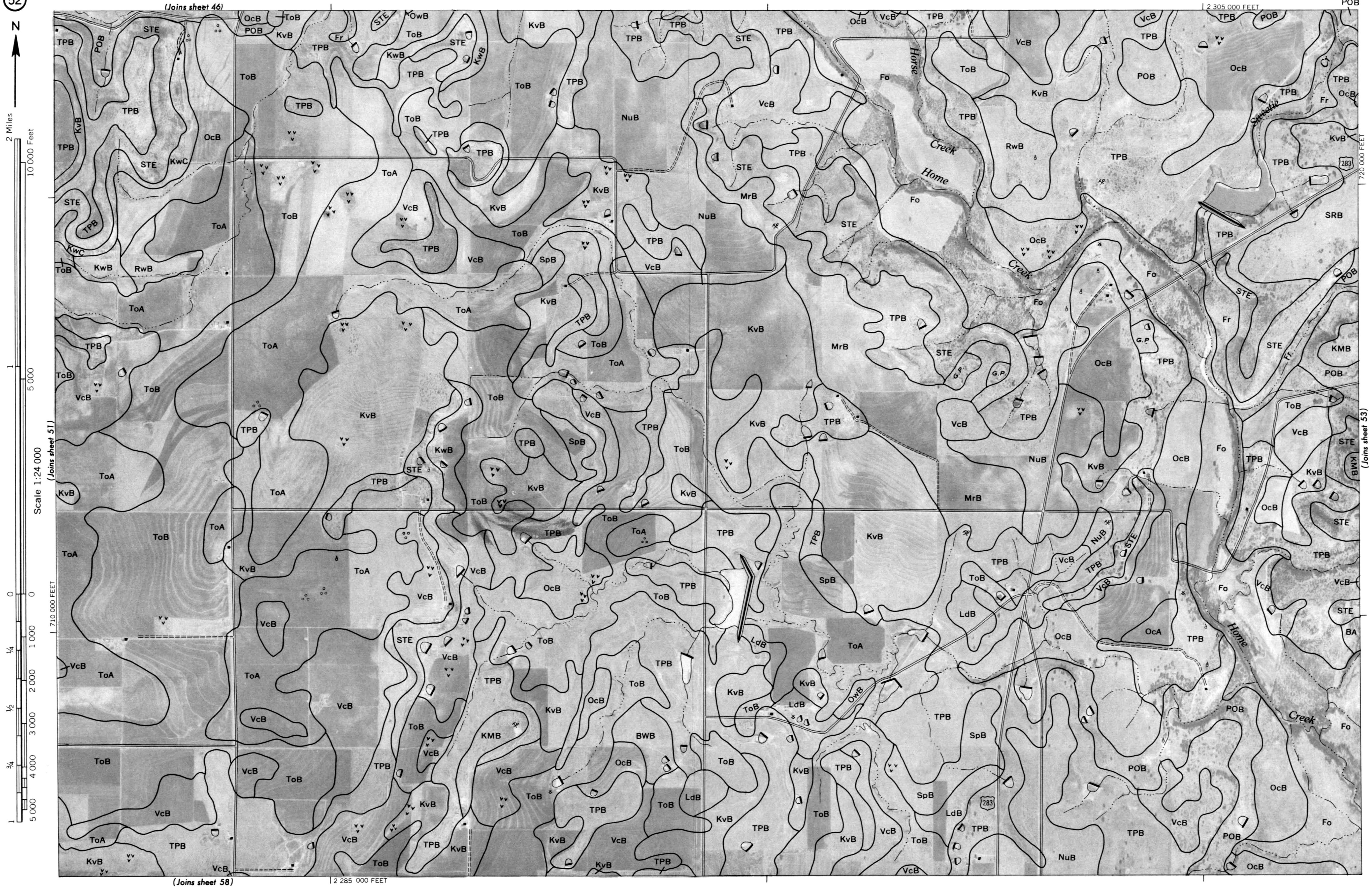
COLEMAN COUNTY, TEXAS — SHEET NUMBER 51

COLEMAN COUNTY, TEXAS NO. 51

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

52

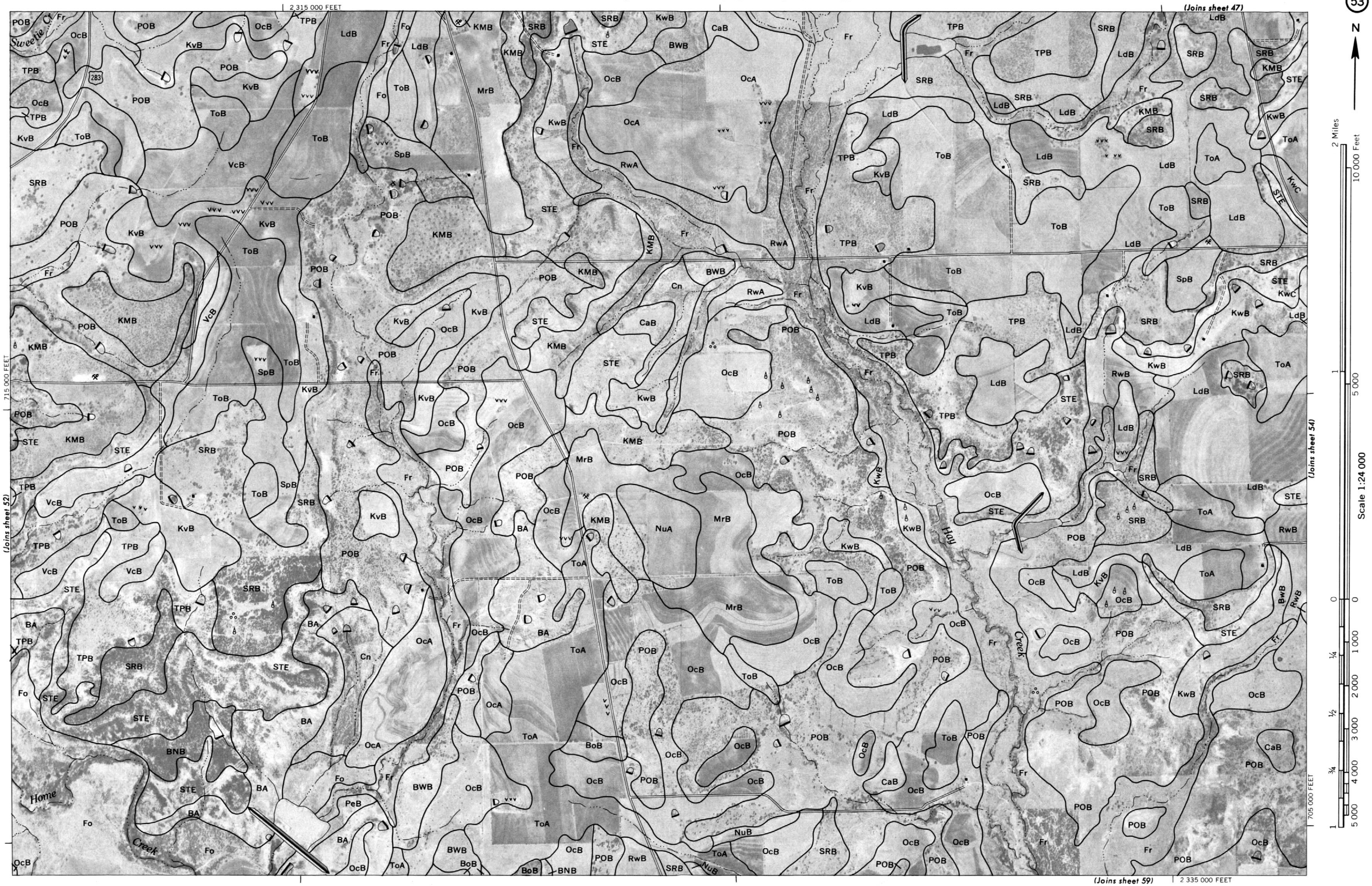
COLEMAN COUNTY, TEXAS — SHEET NUMBER 52



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

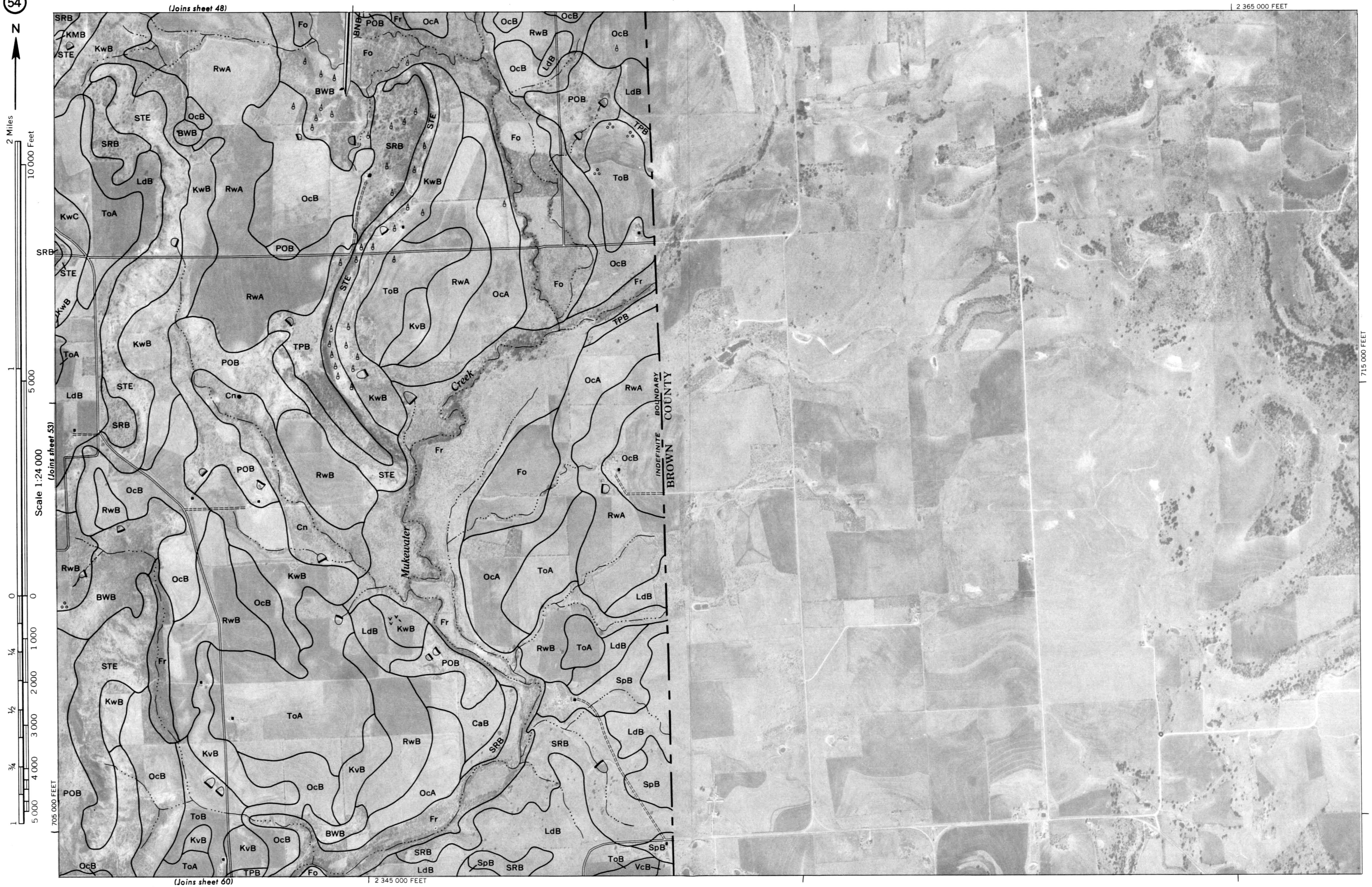
COLEMAN COUNTY, TEXAS NO 52



COLEMAN COUNTY, TEXAS NO. 53

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 54



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

55

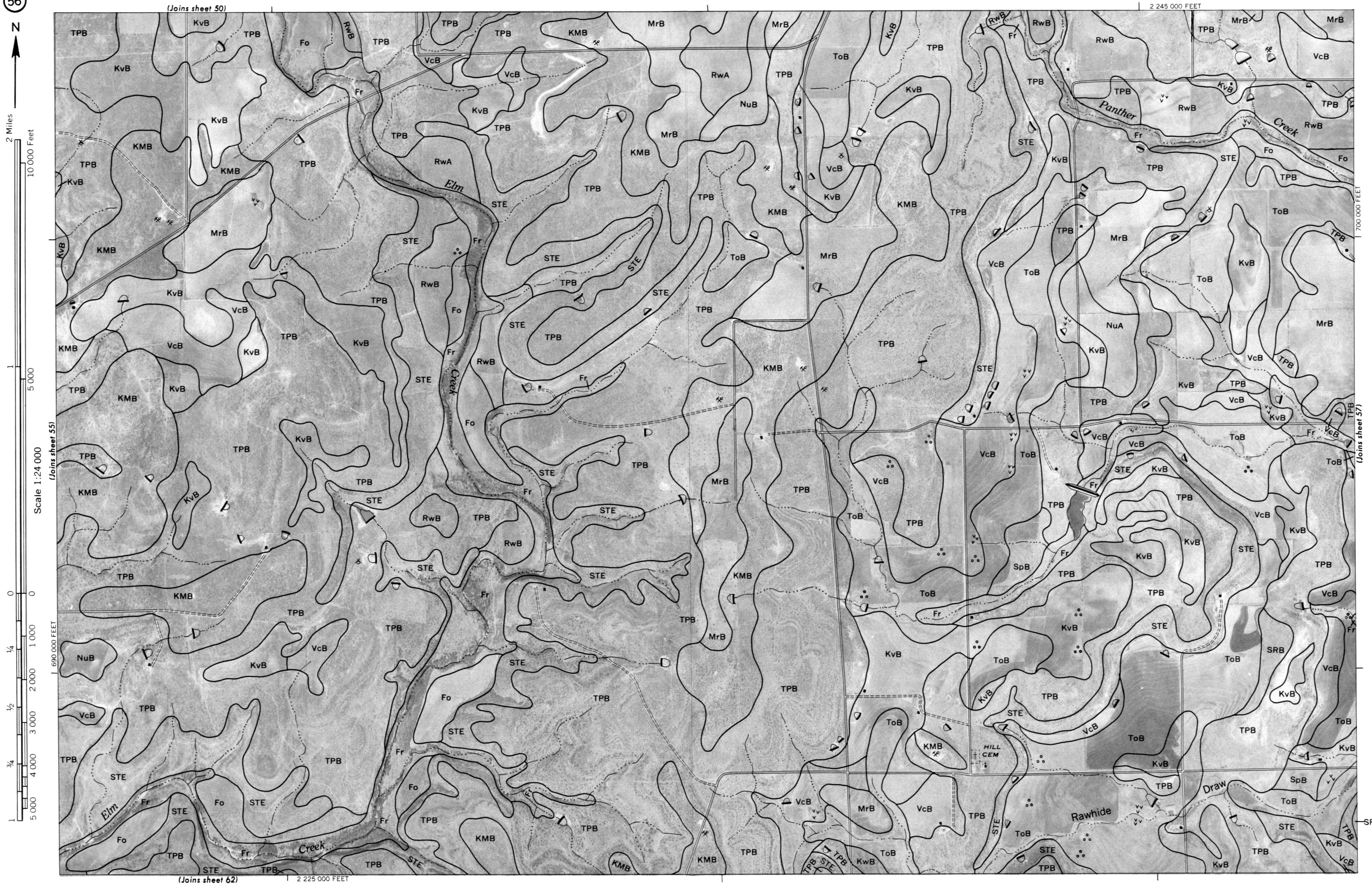
N

Scale 1:24 000

2 Miles | 1 | 1/4 | 1/2 | 3/4 | 0 | 1

10 000 Feet | 5 000 | 0 | 1 000 | 2 000 | 3 000 | 4 000 | 5 000

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 57

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

58

COLEMAN COUNTY, TEXAS — SHEET NUMBER 58

N

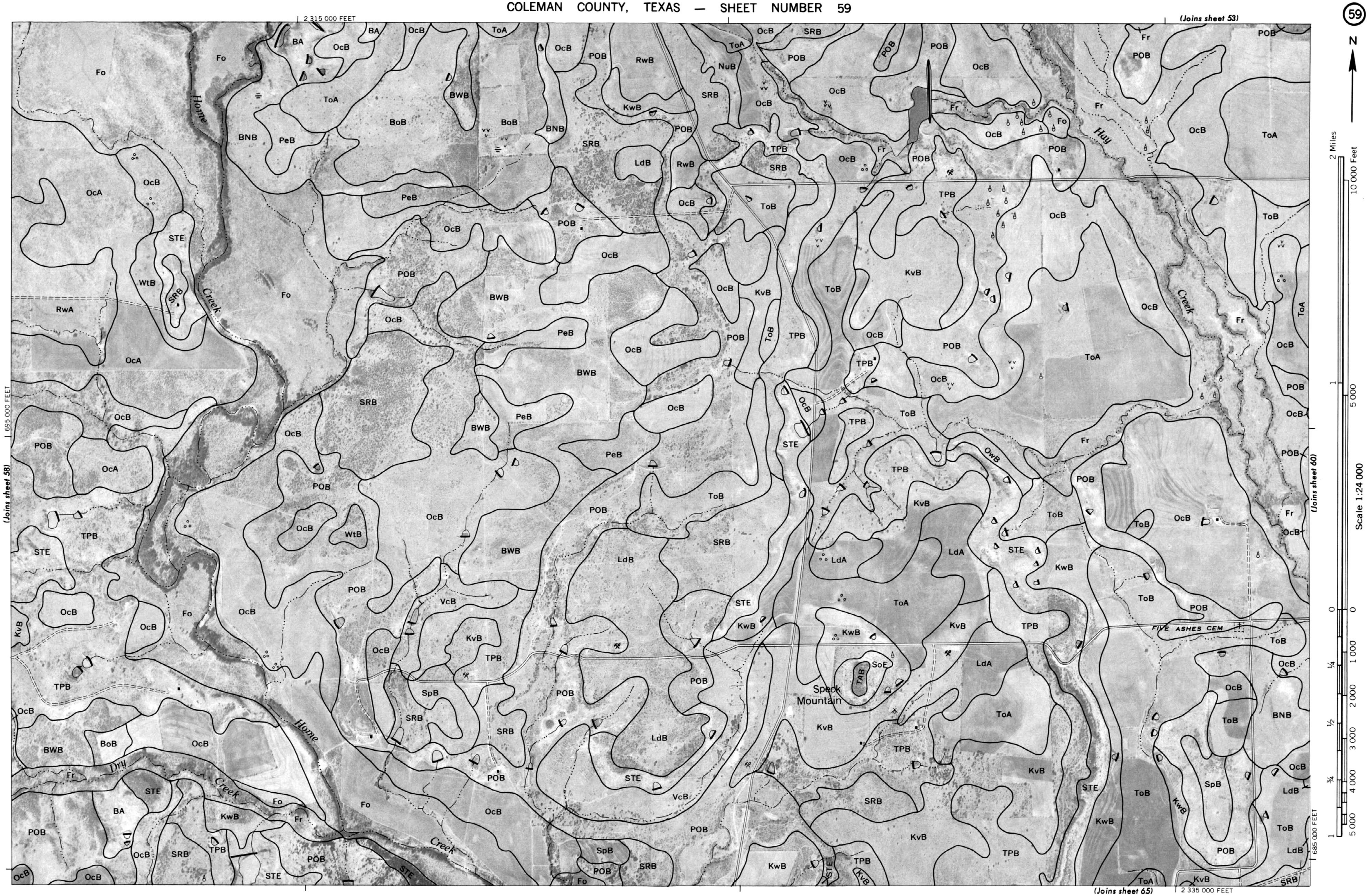
Scale 1:24 000

2 Miles
1
0
¼
½
¾
1

10 000 Feet
5 000
0
1 000
2 000
3 000
4 000
5 000

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

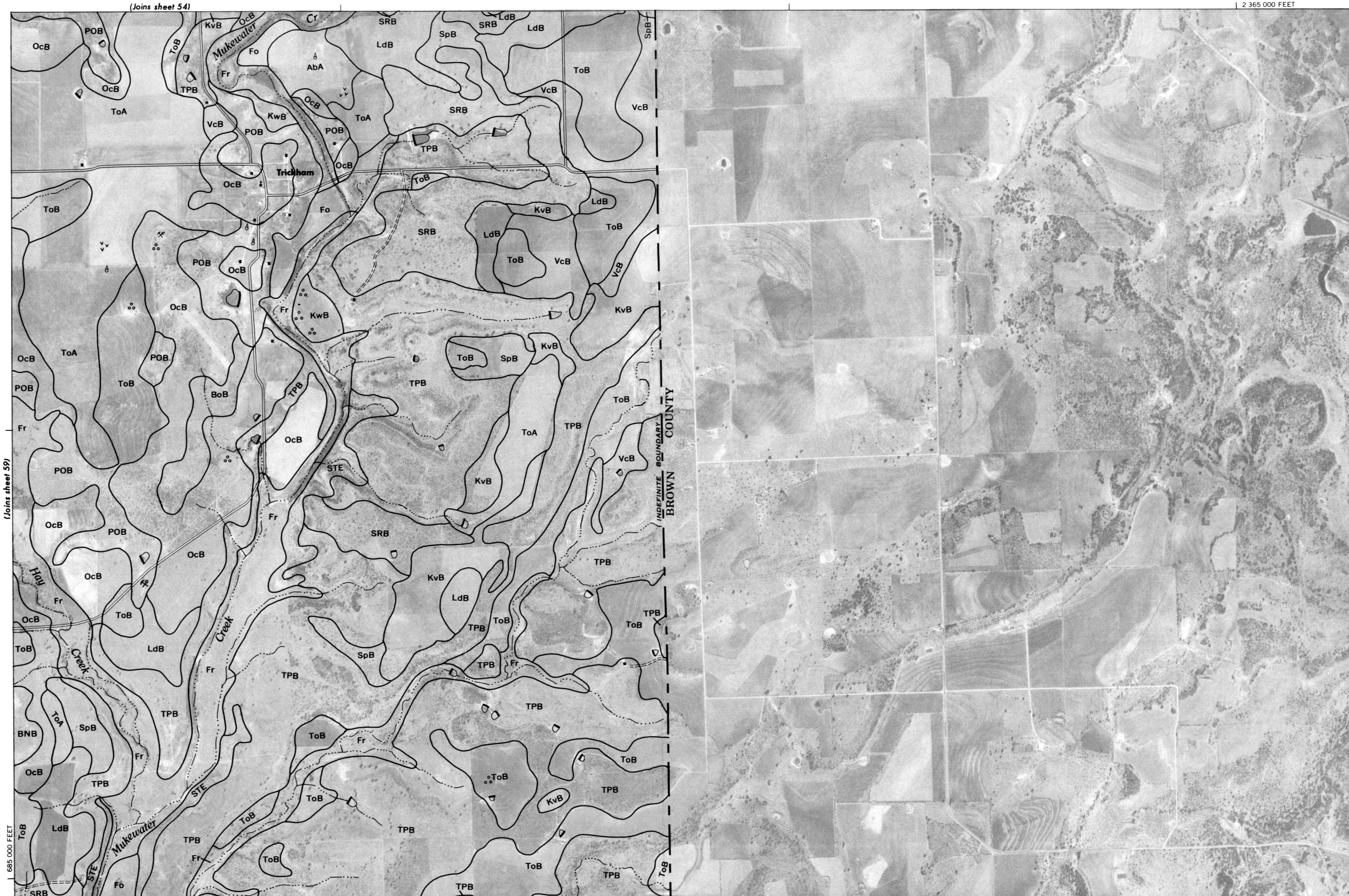
COLEMAN COUNTY, TEXAS NO. 58



COLEMAN COUNTY, TEXAS NO. 59

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 60



N

Scale 1:24 000

2 Miles
10 000 Feet
1
5 000
0
0
1/4
1 000
2 000
1/2
3 000
3/4
4 000
1
5 000

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 61

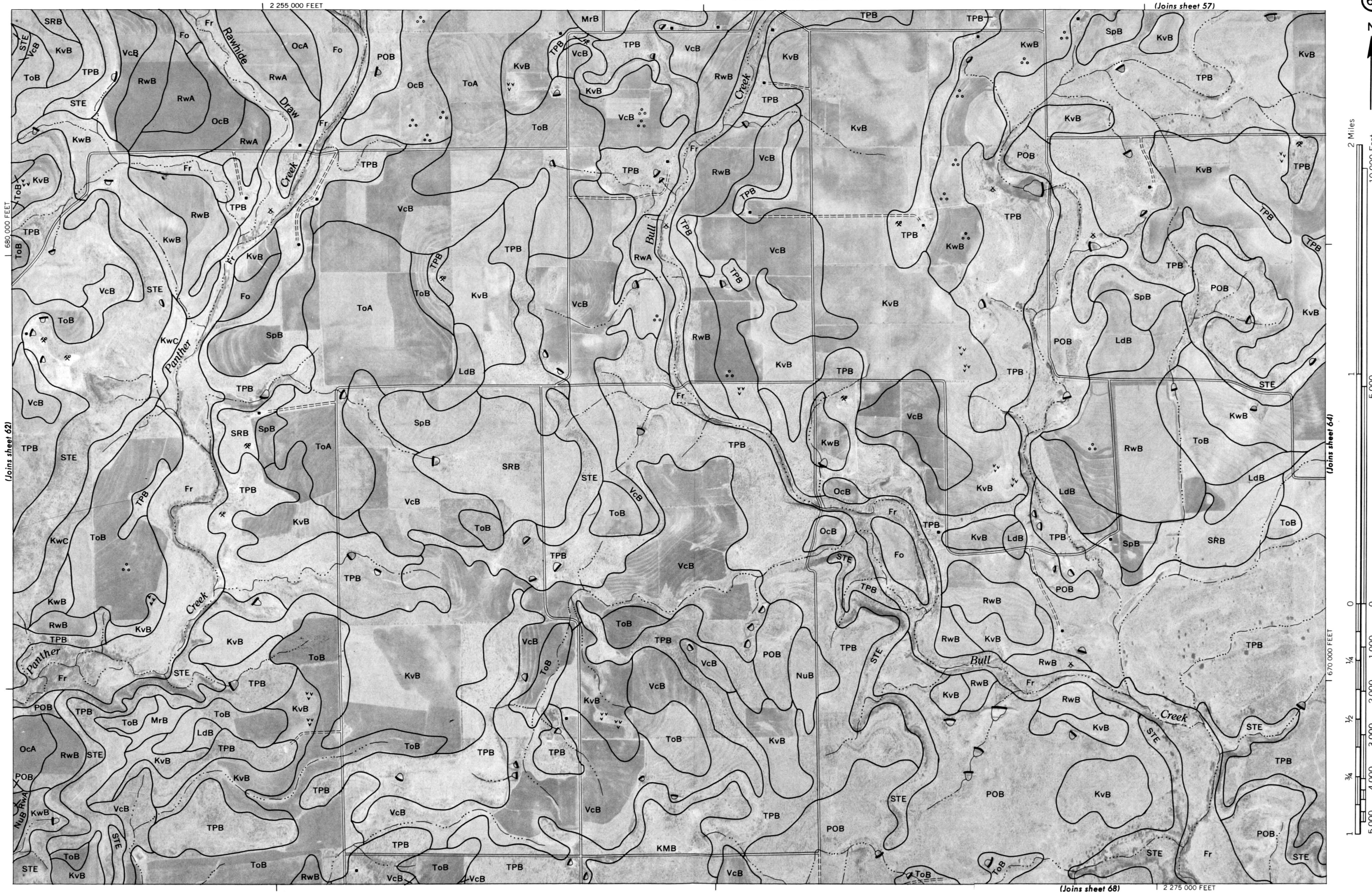
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

62

COLEMAN COUNTY, TEXAS — SHEET NUMBER 62

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

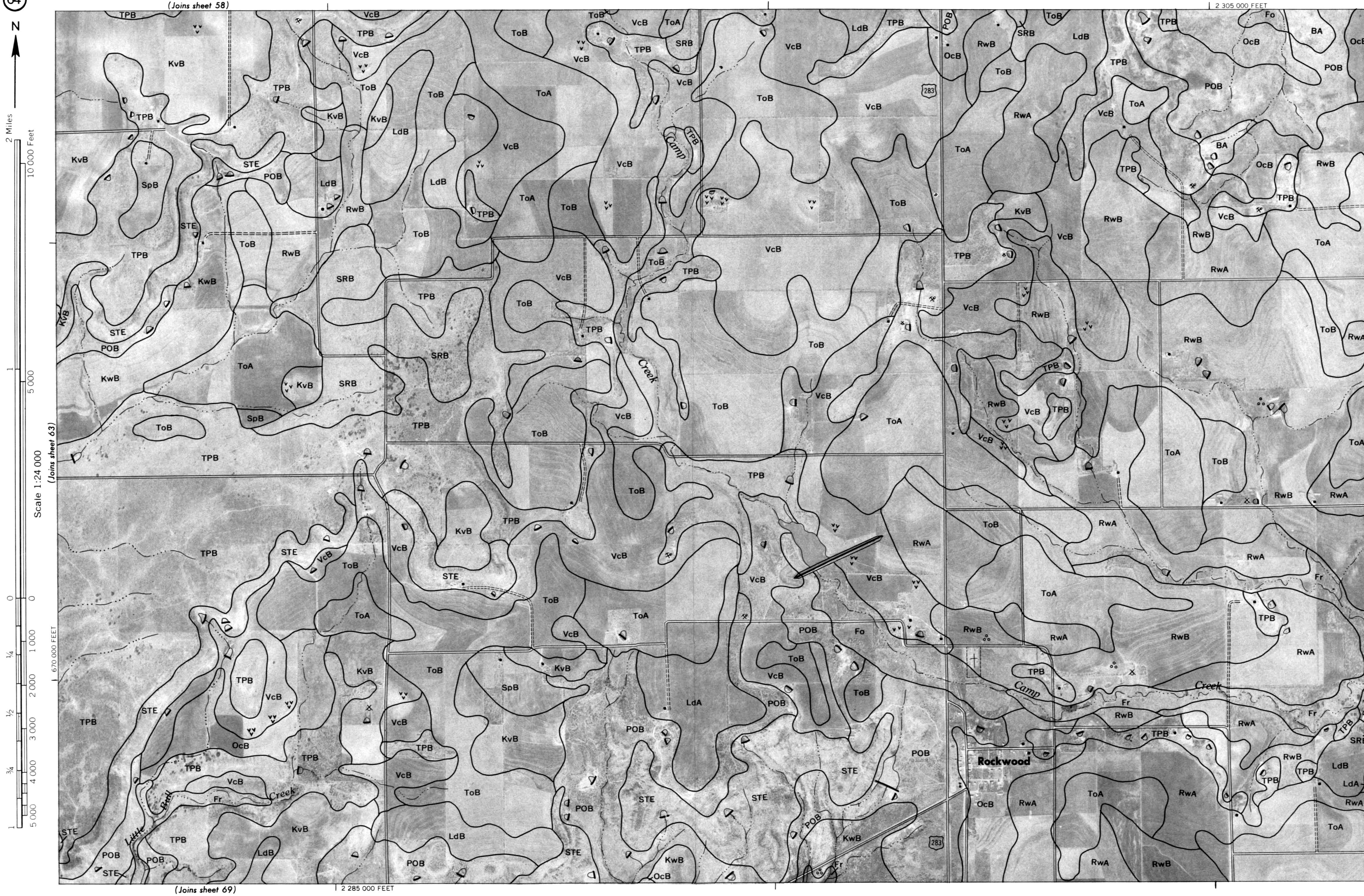
COLEMAN COUNTY, TEXAS NO. 62



COLEMAN COUNTY, TEXAS NO. 63

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 64



Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 64

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

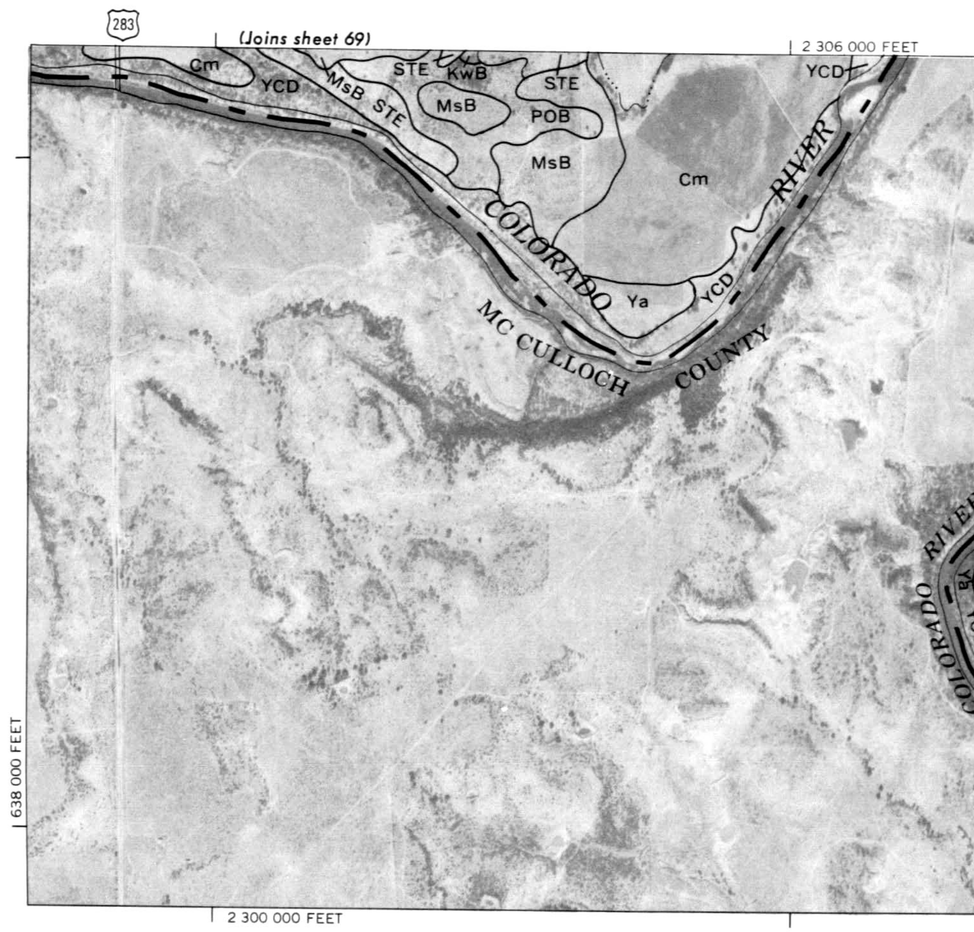
COLEMAN COUNTY, TEXAS — SHEET NUMBER 66

N

Scale 1:24 000

2 Miles | 1 | 0 | ¼ | ½ | ¾ | 1

10 000 Feet | 5 000 | 0 | 1 000 | 2 000 | 3 000 | 4 000 | 5 000

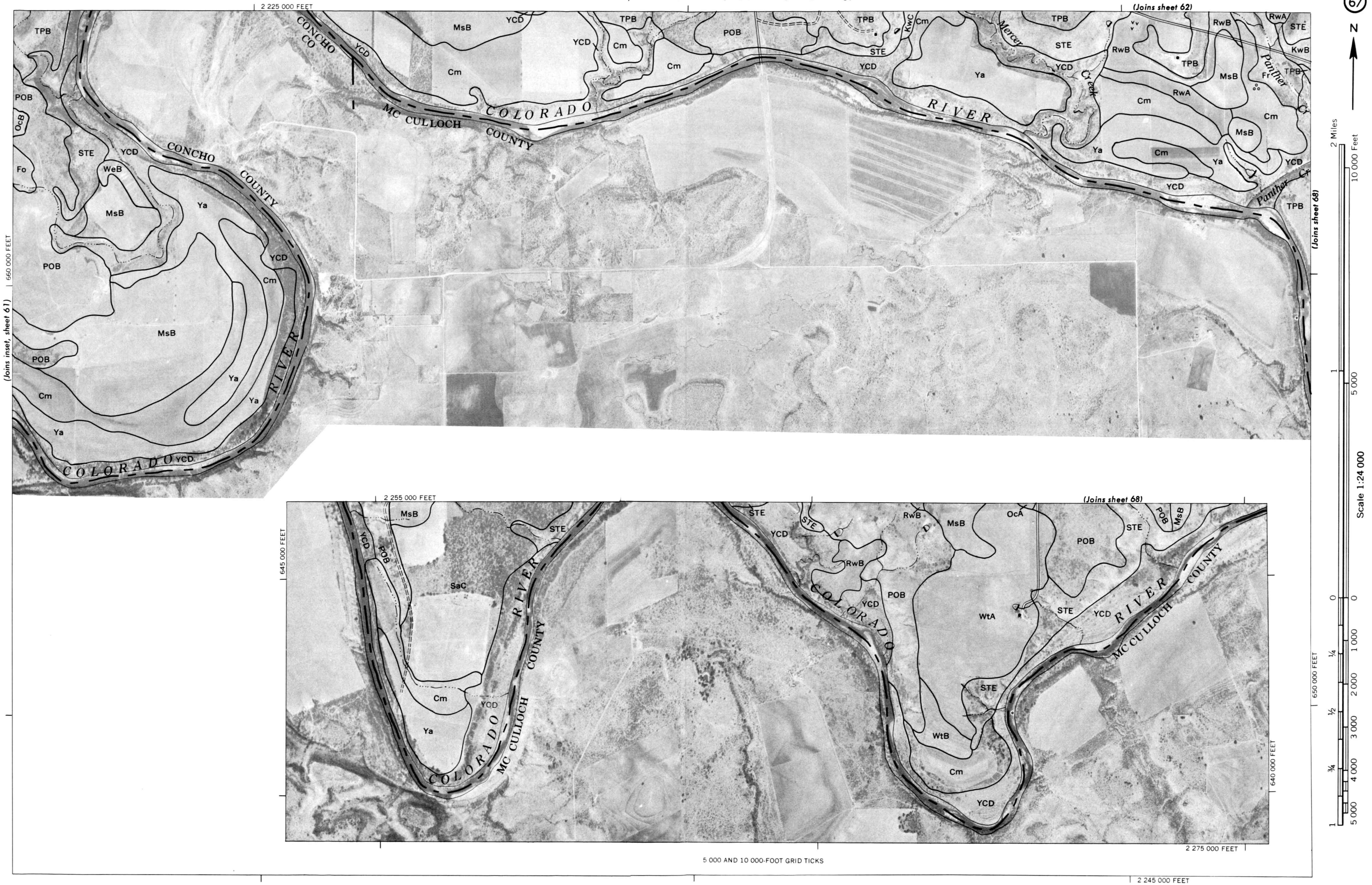


6 000 AND 7 000-FOOT GRID TICKS

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 66



This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 68

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS NO. 68

COLEMAN COUNTY, TEXAS NO. 69

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 70

Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.
This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

COLEMAN COUNTY, TEXAS — SHEET NUMBER 71

COLEMAN COUNTY, TEXAS NO. 71

This map is one of a set compiled in 1972 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1970-71 aerial photography. Positions of 10,000-foot grid ticks are approximate and based on the Texas coordinate system, central zone.